PHYSICS ABSTRACTS

SECTION A

of

SCIENCE ABSTRACTS

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SECTION B, ELECTRICAL ENGINEERING

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35.7 : 612.84 2959

Absolute and differential light sensitivity of the dark-adapting eye. POLLAK, H., AND WILSON, D. G. *Nature, Lond.*, 156, *pp.* 299–300, *Sept.* 8, 1945.

535.7 : 628.9 2960

Avoidance of glare. CARNE, J. B. *Light and Ltg*, 38, pp. 61–64, *May*, 1945.—Gives a summary of existing information regarding the effects of glare, with particular reference to the work of Holladay and Luckiesh. The limitation on brightness in interior lighting and the prohibition of bright sources within the angle of 20° from the line of vision are amply supported. J. W. T. W.

535.733 : 612.84 2961

Colour sensitivity of the fovea centralis. WILLMER, E. N., AND WRIGHT, W. D. *Nature, Lond.*, 156, *pp.* 119–121, *July* 28, 1945.—In a previous paper [see Abstr. 2428 (1944)] it was shown that a small area in the centre of the fovea appeared to have the characteristics of tritanopic vision. The present paper describes a thorough examination of the fovea centralis of two observers and gives the dichromatic coefficient curves for one, the luminosity and spectral mixture curves for a 20 min. field, and hue discrimination curves for this size and for 2°. White can be matched with spectral radiation at 0·578 μ. J. W. T. W.

535.733.1 2962

The fundamental colour sensations in man's colour sense. GÖTHLIN, G. F. *K. Svenska Vetensk. Akad. Handl.*, 76 *pp.*, 1943.—Concludes from the evidence available that yellow is not a fundamental sensation and is not provided with special receptors in the retina. Blue, not violet, is such a fundamental (with red and green). In support of this latter statement new measurements are reported showing that for the range 430–460 mμ most subjects can determine two colour thresholds, a lower one when the test light first appears coloured and blue and a higher one when it first appears to contain red as well. Congenital blue-blinds appear to lack a blue, not violet, response and appreciate the residual red. The author suggests that inhibitory processes in the brain play an important rôle in colour vision and may be connected with the negative coefficients in the fundamental response curves. J. W. T. W.

535.733.1 2963

Electrotonus in colour vision. KRAVKOV, S. V., AND GALOTCHKINA, L. P. *Nature, Lond.*, 155, *pp.* 605–606, *May* 19, 1945.—A study of the effect of a weak electric current on the foveal colour sensitivity of the human eye. It was found that sensitivity was increased over one half of the spectrum and decreased over the other half, being unchanged at either end and in the middle (about 570 mμ). The change was reversed with reversal of the current. J. W. T. W.

535.736 2964

Dark adaptation following light adaptation to red and white lights. HECHT, S., AND HSIA, Y. *J. Opt. Soc. Amer.*, 35, *pp.* 261–267, *April*, 1945.—[See Abstr. 1454 (1945)]. Describes the theoretical basis underlying the use of red light for pre-adaptation to darkness and experiments which demonstrate that dark adaptation after exposure to red light is much faster than after exposure to photopically equal white light. For equal rate of dark adaptation the red may be 30 times as bright as the white. Possible explanations are given for the contrary results found by Lowry [see Abstr. 187 (1944)]. J. W. T. W.

535.755 2965

Tests for the detection and analysis of colour-blindness. I. The Ishihara test: An evaluation. II. The Ishihara test: Comparison of editions. HARDY, L. H., RAND, G., AND RITTLER, M. C. *J. Opt. Soc. Amer.*, 35, *pp.* 268–275, *April, and pp.* 350–356, *May*, 1945.—Emphasizes that tests of this type are very dependent on viewing conditions, especially the colour of the light used as illuminant. A number were made using C.I.E. illuminant C. It is concluded that the test is a good rough screening test for red-green colour blindness, but for this purpose only a few of the plates need be used. It fails to classify the type of defect or to give an evaluation of the extent to which it is present. A comparison of the various editions of the Ishihara cards is reported, including the English reprint of the 9th Japanese edition, and the Ishihara plates in the American Optical Co.'s publication of pseudo-isochromatic charts. There is little significant difference in the results given by the various editions, except in the case of the A.O.C. plates which are liable to give anomalous results. J. W. T. W.

535.755 2966

Tests for the detection and analysis of colour-blindness. III. The Rabkin test. HARDY, L. H., RAND, G., AND RITTLER, M. C. *J. Opt. Soc. Amer.*, 35, *pp.* 481–491, *July*, 1945.—A continuation of a critical examination of colour-vision tests [see Abstr. 2965 (1945)]. The Rabkin polychromatic test plates are examined and it is found that these are much superior to the Ishihara plates as they not only detect the colour defective but enable red-green dichromats to be grouped into protanopes and deuteranopes and red-green anomalous trichromats to be grouped as protanomalous or deuteranomalous. They are not, however, adequate to differentiate between trichromasy and dichromasy. J. W. T. W.

535.755 2967

Darkened violet in colour vision. PICKFORD, R. W. *Nature, Lond.*, 156, *pp.* 506–507, *Oct.* 27, 1945.

535.824.32 2968

Darkfield illuminators in microscopy. WITLIN, B. *Science*, 102, *pp.* 41–42, *July* 13, 1945.

535.825 : 535.33.07 2969

A comparator for spectrographic analysis. MATHER, K. B. *J. Sci. Instrum.*, 22, *pp.* 151–153, *Aug.*, 1945.—A modified form of Judd Lewis comparator is described. Alterations include adjustable plate tables, screw traverse with finger release, Al mirrors in place of totally internally reflecting prisms, field division by use of the 90° edge of a right-angled aluminized prism. A. H.

535.89 : 621.396.615.17 : 534.15 *see Abstr.* 2842

536.2 : 533.6.011 = 82 *see Abstr.* 2828

536.2 : 666.1.031.2 2970

Studies in the distribution of temperature through molten glasses in a tank melting furnace. I. Laboratory measurements on some commercial glasses. HALLE, R., AND TURNER, W. E. S. *J. Soc. Glass Tech.*, 29, *pp. T5–T34, Feb.*, 1945.

536.212 : 517.942.82 2971

Heat conduction in semi-infinite cylinders. CRAGGS, J. W. *Phil. Mag.*, 36, *pp.* 220–222, *March*, 1945.—An extension of recent work by Jaeger [Abstr. 864 (1943)], who considered only the infinite cylinder. An integral transform method is used in solving the equation of heat conduction. The effect of end-conditions on Jaeger's result may now be calculated. L. S. G.

536.212.2 : 621.318.4.017.71 2972

Temperature distribution in toroidal electrical coils of rectangular cross section. HIGGINS, T. J. *J. Franklin Inst.*, 240, *pp.* 97–112, *Aug.*, 1945.—Formulae are obtained for the temperature distribution, T, the maximum temperature T_m and the average temperature T_a for coils such that the ratio of the external to internal diameter is greater than two. The calculation of T involves the solution of a boundary value problem in the theory of heat, and this solution is effected by expansions in orthogonal functions. T_m and T_a are derived from T in the standard manner. The formulae take the form of rapidly converging infinite trigonometric-hyperbolic series. Some numerical examples are given and the results agree well with measured values. L. S. G.

536.25 : 539.217.1 2973

Convection currents in a porous medium. HORTON, C. W., AND ROGERS, F. T., JR. *J. Appl. Phys.*, 16, *pp.* 367–370, *June*, 1945.—The problem considered is the convection of a fluid through a permeable medium as the result of a vertical temperature-gradient, the medium being a flat layer bounded above and below by perfectly conducting media. The min. temperature-gradient for which convection can occur is approx. $4\pi^2h^2\mu/kg\rho_0\alpha D^2$, where h^2 is the thermal diffusivity, g is the acceleration of gravity, μ is the viscosity, k is the permeability, α is the coeff. of cubical expansion, ρ_0 is the density at zero temperature, and D is the thickness of the layer; this exceeds the limiting gradient found by Rayleigh for a simple fluid by a factor of $16D^2/27\pi^2k\rho_0$. A numerical computation of this gradient, based upon the data now available, indicates that convection currents should not occur in such a geological formation as the Woodbine sand of East Texas; in view of the fact that the distribution of NaCl in this formation seems to require the existence of convection currents, and in view of the approximations involved in applying the present theory, it seems safe tentatively to conclude that convection currents do exist in this formation and that the expression given above predicts excessive min. gradients when applied to such a formation.

536.4 : 536.6 : 536.75 2974

Thermodynamic properties of 1,3-butadiene in the solid, liquid, and vapor states. SCOTT, R. B., MEYERS, C. H., RANDS, R. D., JR., BRICKWEDDE, F. G., AND BEKKEDAHL, N. *J. Res. Nat. Bur. Stand., Wash.*, 35, *pp.* 39–85, *July*, 1945.—A detailed description of apparatus used and results obtained in the following measurements: Specific heats from −258° to +30°C. heat of fusion, heats of vaporization from −26° to +23°C., vapour pressures from −78° to +110°C. liquid densities from −78° to +95°C., vapour densities from 30° to 150°C., and the critical pressure volume and temperature.

536.4/.7 2975

The measurement of some thermal properties of water. STEMSON, H. F. *J. Wash. Acad. Sci.*, 35, *pp.* 201–217, *July*, 1945.—Presidential address to the Philosophical Society of Washington, reviewing the major contributions made towards the determination of the specific heat of water, the mechanical equivalent of heat, the vapour pressure of water, the heat of vaporization and the fixed points of water on the temperature scale. R. W. P.

536.41 2976

Effects of some oxide additions on the thermal length changes of zirconia. GELLER, R. F., AND YAVORSKY, P. J. *J. Res. Nat. Bur. Stand., Wash.*, 35, *pp.* 87–110, *July*, 1945.—The oxides of Ce, Y, Si, Mg and Ca were added in various proportions to Zr of 99% purity, and the effects of these additions, combined with preheating at various temperatures from 1 450° to 1 950°C., on thermal length changes during heating and cooling between room temperature and a max. of 1 700°C. were observed. The results are compared with similar observations on Zr of 96%, of 98% and of 99% purity without oxide additions. The irregular thermal length changes accompanying phase transformations in Zr may be prevented by changing the crystal to the stable cubic form. This was accomplished by 11·5% and 15% additions of Y_2O_3 and heating at 1 700°C. or higher; 8% and 15% additions of MgO and heating at 1 550°C. or higher, but only for the range from room temperature to 1 200°C.; and 5%, 6%, 8% and 15% additions of CaO and heating at 1 550°C. or higher, but additions of more than 6% caused the specimens to be very porous and proportionately weak. In all cases, the expansion during heating and contraction during cooling was relatively high. The coefficients of linear thermal expansion of the specimens that were all, or nearly all, cubic ranged from 8·8 to $11·8 \times 10^{-6}$. A high resistance to thermal shock cannot be expected of the stabilized product.

536.42 : 532.14 *see Abstr.* 2782

536.42 : 535.32 : 547.21 2977

On some physical properties of normal paraffins. MIBASHAN, A. *Trans. Faraday Soc.*, 41, *pp.* 374–380, *July*, 1945.—The existence of simple relationships between the refractive index, density, coefficient of thermal expansion and temperature in the *n*-paraffin series is shown. These relationships extend to the case of *n*-paraffins an existing theory of the liquid state.

536.421 2978

The melting-points and unit cells of the methyl-benzenes. BEACALL, T. *Trans. Faraday Soc.*, 41, *pp.* 472–479, *Aug.–Sept.*, 1945.—The m.pts. exhibit variations similar to those shown by the chlor- and brom-benzenes. The m.pts. of *p*-xylene, durene and

examethylbenzene approximate closely to a geometrical series; the volumes of the unit cells approximate to an arithmetical series. *p*-xylene resembles *p*-dichlorbenzene in having an abnormally low m.p., but the volume of its unit cell has a normal value. It is suggested that in *p*-xylene, durene and hexamethylbenzene the pairs of methyl groups in *p*-position are linked to methyl groups of adjacent molecules; this view accords with the published X-ray data for durene and hexamethylbenzene. The quasi-independent effects on the m.p. of the pairs of halogen atoms or methyl groups persist in the symmetrically substituted methylhalogen benzenes; particularly in the case of the hexa-substituted compounds the m.p. can be calculated with a close approximation to the observed values; this is regarded as evidence that the unit cells of these bodies are constructed on the same pattern as the hexamethyl and hexa-halogenbenzenes; the volume of the unit cell of pentabromtoluene calculated from its molecular weight and density is in almost exact agreement with the value obtained by extrapolation from that of benzene by addition of the increments due to the three pairs of substituents; the volumes of the unit cell of 2 : 4 : 5-tribromotoluene computed by the two methods are also in almost exact agreement, although in this case the observed and calculated m.pts. differ by 5%. The lowering of m.p. caused by the introduction of a single methyl group into the benzene ring is repeated, though to a lesser extent, in the symmetrical homologues and halogen derivatives of toluene. It is suggested that this lowering of m.pts. points to a head-to-tail linkage of the toluene molecules in the unit cell. The low m.p. of mesitylene is contrasted with the comparatively high m.pts. of the symmetrical trihalogenbenzenes, and a tentative structure for the unit cell of mesitylene is suggested; confirmation of this suggested structure is given by the m.pts. of the 3 : 5-dihalogentoluenes.

536.423 : 677 2979

Some experiments on the evaporation of water from a plane surface. Rees, W. H. *J. Text. Inst., Manchr*, 36, *T*165–*T*168, *July*, 1945.—A method is described for investigating the effect of fabrics on the rate of evaporation from a moist surface with which they are in contact.

[536.423.15 + 533.12] 2980

The effect of drying on the vapour pressure of dinitrogen tetroxide and the vapour density of dinitrogen trioxide. Stoddart, E. M. *J. Chem. Soc.*, *pp.* 448–451, *July*, 1945.—It is shown that N_2O_4 reacts slowly with P_2O_5 even at room temp., liberating O_2 and forming the compound $P_2O_5.2NO$; the vapour pressure increase is due entirely to this O_2, and the dried liquid has a normal vapour pressure. It has also been shown that the increase in vapour density of vaporized N_2O_3 is due to the formation of this compound, which leaves a gas richer in N_2O_4. The vapour density increase is in agreement with this suggestion.

536.423.15 2981

Vapor pressure of liquid nitric acid. Egan, E. P., Jr. *Industr. Engng Chem.*, 37, *pp.* 303–304, *March*, 1945.—The vapour pressure of liquid (100%) HNO_3 was calculated from thermodynamic data assuming that the fugacity and vapour pressure are equal. The calculated values agreed well with experimental data recently reported. The free energy equation for the vaporization of liquid HNO_3 was found to be:

$$\Delta F^0 = 14\,744 + 22{\cdot}07T\log_e T - 13{\cdot}38 \times 10^{-3}T^2 - 166{\cdot}26T$$

The b.p. calculated from this equation is 84°C. Equations for the heat capacity of liquid and gaseous HNO_3 were developed.

536.423.15 2982

The vapour pressure of trimethylamine from 0 to 40°. Swift, E., Jr., and Hochandel, H. P. *J. Amer. Chem. Soc.*, 67, *pp.* 880–881, *May*, 1945.—The vapour pressure of NMe_3 was measured between 0° and 40° by means of an isotensiscope. The equation $\log P_{mm} = -(2\,018{\cdot}37/T) - 6{\cdot}0303\log T + 24{\cdot}913$ applies over the range studied. The heat of vaporization calculated from this equation is 5 720 cal./mole at the normal b.p., 276·03°K, compared with the calorimetric value of 5 482 cal./mole. W. R. A.

536.424.1 : 548.0 : 537.226.33 = 4 2983

The dielectric constant of NH_4Cl at the transformation point. Dinichert, P. *Helv. Phys. Acta*, 17, 5, *pp.* 400–404, 1944.—Measurements of the dielectric constant are made for solid and powdered crystals of NH_4Cl over a temperature range 10°C. above and below −30°C., the transition temperature. The results can be explained in terms of the theory of Abstr. 2984 (1945). A short kink to a higher value is attributed to crystal rupturing, due to the local pressures developed. R. W. P.

536.424.1 : 548.7 = 4 2984

Hysteresis of the NH_4Cl transformation. Dinichert, P. *Helv. Phys. Acta*, 17, 5, *pp.* 389–399, 1944.—The hysteresis associated with the transformation of NH_4Cl at −30°C. is attributed to the existence of two distinct crystalline forms. The temperature at which the change from one form to the other commences is definite, but the local pressures set up by the volume changes affect the subsequent transformation and cause the observed hysteresis. A theoretical treatment follows. R. W. P.

536.48 2985

The super-fluidity of liquid helium. II. Smith, G. S. *Nature, Lond.*, 155, *pp.* 598–600, *May* 19, 1945.—An account of a recent Russian article by Kapitza. The outstanding properties of liquid He II are high thermal conductivity, low viscosity and the fact that when it flows through a capillary from a high to a lower level the liquid at the lower level is found to be cooled. By repeating this process a sufficient number of times it is thought that temperatures closer and closer to the absolute zero may be reached. To explain these phenomena the suggestion has been made that at temperatures below the λ-point liquid He is a mixture of two liquids, one of which is a normal liquid and the other a liquid characterized thermodynamically by zero entropy and physically by the absence of viscosity. The concentration of the super-fluid He increases with reduction in temperature until at absolute zero, so it is supposed, only this form remains. R. W. P.

536.48 : 534.21 2986

Radiation of sound in helium II. Lifshitz, E. *J. Phys. USSR*, 8, 2, *pp.* 110–114, 1944.—Hydro-

dynamical equations, developed in a previous paper [Abstr. 2176 (1945)], are applied to the propagation of sound in Helium II, with the result that sound waves may travel with two different velocities u_1 and u_2. The velocity u_1, corresponding to the ordinary velocity of sound, is almost constant over the whole range from 0°K. to the critical point, while u_2 changes rapidly with temperature, becoming zero at the critical point and increasing to the value $u_1/\sqrt{3}$ at 0°K. L. S. G.

536.55 : 667.624 2987

Temperature-indicating paints. TYTE, L. C. *Proc. Instn Mech. Engrs, Lond.*, 152, 2, *pp.* 226–231, 1945.—The requirements to be satisfied by temp.-indicating pigments are stated and the development of pigments to meet this specification is described. The extension to multiple transition paints and the development of binding materials and the composition of the paints are then discussed. Methods of application of the paints and the recording of results are considered. Factors influencing the temp.-colour change relations are then examined; they include (*a*) the time effect, (*b*) the effect of liquid films and gases, (*c*) the effect of heat transfer by conduction and radiation, and (*d*) redistribution of temperatures during cooling of the body. Consideration is given to the estimated accuracy of the temperature indicated. A review of uses in mechanical, electrical and chemical engineering, metallurgy and teaching is made.

536.58 : 621.56 2988

Reduction of spatial temperature variations in air-cooled cold storage rooms. I. STEEVES, T. A., AND COOK, W. H. *Canad. J. Res. F.*, 23, *pp.* 253–262, *July*, 1945.—The presence of boxes was found to increase the spatial temperature variations in a refrigerated room. By forcing the air to pass through the stack, by blocking the aisles, such variations were reduced to approx. the value prevailing in the empty room. Dunnage spacing also reduced temperature variations, but no significant difference was found between spacings varied from $^5/_{16}$ in. to 2 in.

536.58 : 662.62 2989

Thermostatic control as an aid to efficiency in fuel utilization. LONGWORTH, A. L. *Inst. Fuel War Time Bull.*, *pp.* 266–277, *Aug.*, 1945.—A broad survey of all types of thermostatic control equipment applicable to heating or cooling by any type of fuel or power supply. A method of coded classification is suggested based on function, and sub-divided according to physical action. Examples of its use are given, and the selection of the most suitable control is shown to be of more importance than sensitive instruments. A discussion follows in which the need is expressed for consideration to be given to the exact meanings of such terms as "hunting" when used in thermostatic control practice. R. W. P.

536.581 = 3 2990

Regulation of temperature with an accuracy equal to the sensitivity of response of a regulator of the pulsation type. EGGERS, H. R. *Elektrotech. Z.* [*ETZ*], 64, *pp.* 98–102, *Feb.* 25, 1943.—The accuracy of temperature regulation by the pulsation method is improved by the use of a thermocouple arranged inside a ceramic tube fitted with a heating coil. The device is adapted to the measuring range of the regulator and to the supply voltage by an exchangeable series resistor. Examples are given showing the effectiveness of the device. R. N.

536.587 : 621.365.4 2991

Furnace temperature control. MANJOINE, M. J. *Iron and Steel*, *p.* 252, *July*, 1945.—A vacuum-tube thermocouple device for use on electric furnaces, characterized by its anticipating nature and capable of increasing the sensitivity and response of conventional temp. controls by a large amount, is described. It consists of 2 thermocouples of different thermal capacities which receive heat from a heating element, all being enclosed in a vacuum tube. The element is energized by a current $\propto$ the furnace current. The thermocouple with the lower capacity operates more quickly than the other and alters the voltage at the temp. controller, which in turn changes the furnace temp. M.-V.

536.6 : 536.75 : 536.4 *see Abstr.* 2974

536.63 = 4 2992

New methods for measuring the specific heat of metals at high temperature. PERSOZ, B. *Ann. Phys., Paris*, 14, *pp.* 237–301, *July–Dec.*, 1940.—Two methods are used by the author, one similar to that of Néel is used for determinations on Cu, and 25%Ni . 75%Cu and 50%Ni . 50%Cu alloys up to about 350°C. In the second method the heat dissipated in a wire is measured by a ballistic wattmeter, determinations being made on Pt from 0° to 1 000°C. for which $c_\rho = 0{\cdot}0311 + (6{\cdot}6 \times 10^{-6}t)$, and on 99·5% Ni from 500° to 1 000°C. for which $c_p = 0{\cdot}119 + (29{\cdot}2 \times 10^{-6}t)$, where t is in deg. C. R. W. P.

536.631 2993

Specific heats at low temperatures of $Al_2(SO_4)_3$, $Al_2(SO_4)_3.6H_2O$, $KAl(SO_4)_2$ and $KAl(SO_4)_2.12H_2O$. SHOMATE, C. H. *J. Amer. Chem. Soc.*, 67, *pp.* 765–767, *May*, 1945.—The specific heats of $Al_2(SO_4)_3$, $Al_2(SO_4)_3 . 6H_2O$, $KAl(SO_4)_2$ and $KAl(SO_4)_2 . 12H_2O$ were measured over the range 52–298°K. $KAl(SO_4)_2 . 12H_2O$ has a transition at 59·7°K., with a heat of transition of 46·9 cals./mole. The molal entropies at 298·16°K., evaluated by graphical integration of a plot of log T against C_p are: $Al_2(SO_4)_3$, 57·2 ± 0·3; $Al_2(SO_4)_3 . 6H_2O$, 112·1 ± 0·7; $KAl(SO_4)_2$, 48·9 ± 0·3; $KAl(SO_4)_2 . 12H_2O$, 164·3 ± 2·0. The free energies of these compounds at 298·16°K. are: −739 500 ± 450, −1 103 300 ± 430, −534 190 ± 330, and −1 227 660 ± 650 cals./mole respectively. The heats, entropies and free energies of reaction are computed for several related reactions. W. R. A.

536.631 2994

Low temperature specific heats of α-manganese and γ-manganese. SHOMATE, C. H. *J. Chem. Phys.*, 13, *pp.* 326–328, *Aug.*, 1945.—The sp. hts. of α- and γ-Mn were measured in the temp. range 52°–298°K. The sp. ht. curve of α-Mn exhibited a small hump, extending over the temperature range 63°–103°K., with the peak occurring about 95°K. No anomaly appeared in the sp. ht. curve of γ-Mn. The computed heat contents and entropies per g. atom are as follows: αMn, $H^\circ_{298{\cdot}16} - H^\circ_0 = 1\,193 \pm 4$ cal., and $S^\circ_{298{\cdot}16} = 7{\cdot}59 \pm 0{\cdot}04$ E.U.; γ-Mn, $H^\circ_{298{\cdot}16} - H^\circ_0 = 1\,221 \pm 4$ cal., and $S^\circ_{298{\cdot}16} = 7{\cdot}72 \pm 0{\cdot}04$ E.U.

536.631 : 536.71 *see Abstr.* 3004

36.658 2995

Low-pressure isothermals and heats of sorption. OSTER, A. G. *J. Chem. Soc.*, *pp.* 360–366, *June*, 945.—A new method of calibrating the Pirani gauge or measuring the pressure of condensable vapours p to about 0·5 mm. is described. Sorption iso-hermals of H_2O, EtOH, PhMe, dioxan, *n*-octane, nd CCl_4 were determined at 25° on SiO_2 and Fe_2O_3 els: all give the linear plot of p/c against p demanded y Langmuir's theory. The values calculated for the mounts held in the completed unimolecular layer how good agreement with previous estimates made rom data at higher pressures. Heats of sorption vere calculated using the Clapeyron equation, and ompared with the values calculated by statistical heory from the constant of Langmuir's equation. The entropy changes accompanying the sorption rocess were also calculated and shown to be con-stent with the view that the adsorbed molecules ehave as 3-dimensional oscillators. They are of the ame order as the changes accompanying the transition rom vapour to normal liquid.

36.66 2996

A calorimetric method for the determination of *cyclo*pentadiene. SEFTON, R. *J. Soc. Chem. Ind.*, 64, *pp.* 104–106, *April*, 1945.—The method is based on he heat of reaction of *cyclo*pentadiene (*cp.*) with naleic anhydride. More concentrated solutions may e diluted to reduce the *cp.* content to within this ange. The method is not specific to *cp.* and may be ffected by certain other conjugated diolefines. The pplication of the method to the testing of benzoles is escribed and experience with many such samples howed that the conjugated diolefine content consisted ssentially of *cp.* Other applications are indicated with reference to benzole fore-runnings, fractions from racked gasoline and coke-oven gas.

536.662 + 536.666 2997

Heats of combustion and isomerization of the eight C_9H_{12} alkylbenzenes. JOHNSON, W. H., PROSEN, E. J., AND ROSSINI, F. D. *J. Res. Nat. Bur. Stand., Wash.*, 35, *pp.* 141–146, *Aug.*, 1945.—The heats of isomeriza-ion were determined by measurement of the ratios of he heats of combustion in the liquid state of purified samples of these compounds by the procedure previously described for the hexanes, heptanes, and octanes.

536.662 2998

The heat of formation of aluminium oxide. SNYDER, P. E., AND SELTZ, H. *J. Amer. Chem. Soc.*, 67, *pp.* 683–685, *April*, 1945.—The Al used was in the form of high-purity foil, instead of powder, to minimize surface pre-oxidation. High-grade zircon crucibles lined with a heavy layer of pure Al_2O_3 were employed. No ignition aids were used, apart from the Fe fuse wire, and the isothermal-bomb-calorimeter used was calibrated with benzoic acid. The heat of formation of the Al_2O_3, obtained as the α, or corundum, form, was $-399{\cdot}04 \pm 0{\cdot}24$ kcal. W. R. A.

536.666 + 536.662 *see Abstr.*

536.666 2999

Heats of formation of $NH_4Al(SO_4)_2 . 12H_2O$ and $NH_4Al(SO_4)_2$. YOUNG, F. E. *J. Amer. Chem. Soc.*, 67, *pp.* 851–854, *May*, 1945.—The heats of solution of $(NH_4)_2SO_4$ and $NH_4Al(SO_4)_2 . 12H_2O$ in HCl.12·68 H_2O and of $(NH_4)_2SO_4$ and $NH_4Al(SO_4)_2$ containing 1·80, 1·89, and 2·11 wt.% of H_2O in KOH.277.3H_2O were measured. The heats of formation from the elements of $NH_4Al(SO_4)_2 . 12H_2O$ and $NH_4Al(SO_4)_2 . 0{\cdot}2469H_2O$ are calculated to be $1\,419\,360 \pm 300$, and $-562\,510 \pm 280$ cal./mole respectively. The heats of solution and formation of anhyd. $NH_4(SO_4)_2$ are estimated to be $-41\,840$ and $-561\,190$ cal./mole respectively. W. R. A.

536.7 3000

The statistical thermodynamics of multicomponent systems. MCMILLAN, W. G., JR., AND MAYER, J. E. *J. Chem. Phys.*, 13, *pp.* 276–305, *July*, 1945.—The method of the general canonical ensemble is generalized for multicomponent systems, and equations obtained for calculating the thermodynamic properties and distribution functions of such systems at any particular set of fugacities in terms of those functions at any other fugacity set. The general equations are applied to the imperfect multicomponent gas, to isotopic gas mixtures and to condensed systems with the variables converted to the usual activities and activity coefficients. Pressure increments can be evaluated in terms of solute concentrations. Equations for osmotic pressure are found to be analogous to those for the pressure of an imperfect gas. The osmotic pressure in a binary system plays a rôle analogous to that of the total pressure of a gaseous system, and the existence of a region of anomalous first-order transition near the critical mixing temperature is shown to be probable. R. W. P.

536.7 : 532.13 : 537.312.62 *see Abstr.* 3016

536.7 : 532.782 *see Abstr.* 2812, 2813

536.7 : 535.343 : 541.121 3001

Thermal decomposition of $HgCl_2$ vapour. WIELAND, K. *Nature, Lond.*, 156, *pp.* 504–505, *Oct.* 27, 1945.

536.7 : 550.31 3002

Thermodynamics of a gas migrating vertically through the sedimentary column. TRIPP, R. M. *Geophysics*, 10, *pp.* 229–237, *April*, 1945.—The gaseous hydrocarbons in a petroleum trap which escape to the surface by diffusing through the semi-permeable geologic column are studied thermodynamically and the influence of the action upon the chemical, physical, or biologic equilibrium of the local environment is determined.

536.7 : 576 : 532 *see Abstr.* 2771

536.71 3003

The principle of corresponding states. GUGGENHEIM, E. A. *J. Chem. Phys.*, 13, *pp.* 253–261, *July*, 1945.—The principle in modern form was applied to the following properties: the critical state, the virial coefficient, the Boyle point, the densities of coexistent phases, the v.p. of the liquid, the entropies of evaporation and of fusion, the coeff. of thermal expansion of the liquid, the triple-point temperature and pressure, the heat capacity of the liquid, and the surface tension of the liquid. It was shown that A, Kr, Xe, and with less accuracy Ne, follow the principle with respect to all these properties. It was shown that N_2, O_2, CO, and CH_4 follow the principle with fair accuracy as vapours and as liquids, but not as solids. The relations between surface tension, temperature, and

densities were analysed empirically. For the "ideal" substances under consideration Katayama's modification of Eötvös' relation holds good, but McLeod's relation does not; in the relation $\gamma \propto (\rho_l - \rho_c)^s$, the exponent s is not 4 but much more nearly $3\frac{2}{3}$.

536.71 : 536.631 3004

The heat content of manganese at high temperatures. NAYLOR, B. F. *J. Chem. Phys.*, 13, *pp.* 329–332, *Aug.*, 1945.—Heat contents above 298·16°K. of 2 samples of electrolytic Mn were determined from room temperature to about 1 440°K. 3 transitions occurring at 1 000 ± 2°, 1 374 ± 5°, and 1 410 ± 5°K. with heat effects of 535, 545, and 430 cal./g. atom, respectively, were observed. Smooth curve values at 100° intervals and corresponding entropies are given with heat content and sp. ht. equations for the 4 modifications of Mn. A sp. ht. equation for γ-Mn was derived for the temperature range 298–1 374°K. from low temperature and high temperature thermal data; and corresponding heat contents and entropies above 298·16° for γ-Mn were calculated.

536.71 : 539.2 : 548.7 : 530.145 *see Abstr.* 2743

536.73 : 530.145 = 4 3005

The second law and the quantum theory. DEMERS, P. *Canad. J. Res. A*, 23, *pp.* 47–55, *May*, 1945.—On the supposition that the most elementary process is set in operation by an optical mechanism equivalent to a Maxwell's demon, the second law of thermodynamics is established by evaluation of relationships between entropy, probability and work and is shown to be a consequence of the quantum theory. R. W. P.

536.75 : 536.6 : 536.4 *see Abstr.* 2974

536.8/: 621.4 3006

The new specific heats and energy charts for gases. GEYER, E. W. *Engineering*, 159, *pp.* 381–383, *May* 18, *and pp.* 423–424, *June* 1, 1945.—Energy charts have been prepared and used to give the thermal efficiencies of internal combustion engine and gas turbine cycles. The charts are similar to those originally published by Gouldie, but the specific heats now used are those published by Heck from 600° to 5 400°F. at 100° intervals. New tables of the entropy and internal energy of N_2, O_2, CO_2 and H_2O are now calculated from 400° and 0°F. respectively to 5 400°F. Several typical examples involving the use of these data are given. R. W. P.

537.12 : 537.525.6 *see Abstr.* 3021

537.122 3007

On the classical theory of radiating electrons. ELIEZER, C. J., AND MAILVAGANAM, A. W. *Proc. Camb. Phil. Soc.*, 41, *pp.* 184–186, *June*, 1945.—The relativistic equations of motion of a point-electron in an electromagnetic field, appearing in Dirac's classical theory of radiating electrons [Abstr. 3660 (1938)] are discussed. It is pointed out that not all solutions of the equations are physically admissible and a further principle—called the principle of radiative equilibrium—is introduced as a criterion for those solutions which have physical meaning. This principle states that a state of equilibrium should be reached, after a sufficient lapse of time, between the emitted and absorbed radiation fields. An example of the application of the principle is given. It relates to the rectilinear motion of an electron in a uniform electric field. L. S. G.

537.213 : 537.222 : 517.544.2 3008

Ten two-dimensional electrostatic problems. DAVY, N. *Phil. Mag.*, 36, *pp.* 153–169, *March*, 1945.—The first 9 problems are solved by the Schwarz–Christoffel transformation, the following results being found: (1) the transformations, (2) the field strengths, (3) the surface densities at points on electrodes, (4) the total charges on parts of electrodes, (5) the capacities between parts of electrodes, (6) expressions for the forces on small para- or diamagnetic bodies at some point in the field. Plots are given of the equipotentials. The electrode configurations are (s.i.r.e. = semi-infinite rectangular electrode): I. s.i.r.e. at potential V in line with a semi-infinite thin plate at potential zero. II. s.i.r.e. at potential V in line with a finite thin plate at potential zero. III. s.i.r.e. with thin finite central projecting plate at potential V. IV. s.i.r.e. with a thin finite central projecting plate at potential V in line with a semi-infinite thin plate at potential zero. V. Two equal s.i.r.e's. with thin finite central projecting plates at equal and opposite potentials facing each other. VI. s.i.r.e. with equal thin projecting plates at potential V. VII. s.i.r.e. with equal thin lateral projecting plates at the end, at potential V. VIII. Thin s.i.r.e. at potential V in line with a thin finite plate at potential zero. IX. Central finite thin plate at potential $-V$ between two other collinear thin plates at potential V. X. Two unequal thin collinear plates at potentials $\pm V$. L. S. G.

537.222 : 517.544.2 : 537.213 *see Abstr.* 3008

537.226.2 3009

Dielectric constants of some titanates. WUL, B. *Nature, Lond.*, 156, *p.* 480, *Oct.* 20, 1945.

537.226.3 3010

Dielectric dispersion and absorption in Neoprene gum and tread stocks. SCHNEIDER, W. C., CARTER, W. C., MAGAT, M., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 67, *pp.* 959–963, *June*, 1945.—The dielectric losses of Neoprene–GN gum and tread were measured at 20°, 40° and 60°, over a frequency range of 60 c/s to 3 000 Mc/s. The Kirkwood–Fuoss theory of dielectric dispersion was verified over a wide frequency region, and the dipole per monomer unit for Neoprene–GN gum was found to be 1·99 *D*. Experimental evidence confirms that there is only slight interaction between C black and Neoprene. The free energies of activation and the relaxation times were determined for the gum, and from the former it was calculated that the relaxing units contain 17 C atoms. The energy of activation and entropy of activation for Neoprene gum are 14·3 kcal. and 23·6 entropy units. The distribution in entropy of activation arising from the distribution in free energy of activation was found to be 17·0 entropy units. The variation of the dielectric loss of Neoprene tread with frequency may be explained by use of the Maxwell–Wagner theory of dielectric relaxation. The high value of the permittivity of the tread (6·45 *D*) at 3 000 Mc/s indicates that there is another region at higher frequencies. W. R. A.

537.226.33 : 548.0 : 536.424.1 = 4 *see Abstr.* 2983

537.228.1 : 553.621 : 548.574 *see Abstr.* 3123

37.228.1 : 534.133 : 621.396.611.21 3011

Harmonics in the piezo-electric oscillation of a quartz rystal. TSIEN, L. C., AND CHU, H. C. *Nature, ond.*, 156, *p.* 424, *Oct.* 6, 1945.

37.228.3/.4 : 535.515 = 3 3012

Electro-optical properties of the Rochelle-Electric rystals KH_2PO_4 and KD_2PO_4. ZWICKER, B., AND CHERRER, P. *Helv. Phys. Acta*, 17, 5, *pp.* 346–373, 944.—The variation of the natural double refraction ith temperature and the Kerr effect for KH_2PO_4 nd KD_2PO_4 have been investigated, especially at nd below the Curie point. An anomaly occurs in ne double refraction at this temperature, which is garded as a "spontaneous" Kerr effect. The electro-ptical effects in the Curie region show hysteresis, turation and a residual effect. The hysteresis curves ow marked Barkhausen jumps. These optical nomalies are due to the anomalous behaviour of the lectrical polarization, and it is possible to calculate, om the optical properties, the variation of dielectric onstant with temperature, the anomalous specific eat, and other properties, in agreement with experi-ent. It is also possible to follow the "freezing" of he electrical spontaneous polarization with decreasing emperature much better by optical than by other ethods. A lower Curie point, such as exists for ochelle salt, could not be detected in the case of H_2PO_4 or KD_2PO_4. A. J. M.

37.241 3013

A note on the charge produced by spraying liquids ith a jet of air. CHIH-EN, G. *Phil. Mag.*, 36, *p.* 218–219, *March*, 1945.—The charge is calculated n the assumption that it arises from the change in urface tension produced when a drop, of radius R, reaks up into a large number of smaller drops. f the charge on each small drop is q it is shown that $q^2 \propto R^3$. L. S. G.

37.311 : 537.363 3014

Direct conductivity measurements in electrophoretic oundaries. LAGERCRANTZ, C. *Ark. Kemi Min. Geol.*, 19*A*, 1, *No.* 7, 21 *pp.*, 1945.—Various observa-ions made in electrophoretic investigations indicate hat the potential gradient is not uniformly dis-ributed through the whole tube, and a special pparatus for the direct measurements of electrolytic onductivity in the electrophoretic tube is described. A series of experiments were performed with this pparatus on electrophoretically uniform colloids nd on mixtures (serum), and optical diagrams are given together with the conductivity curves, while nobilities are corrected by the aid of the actual onductivity values. The differences between the nobility values from the rising and the descending side are greatly diminished hereby. The boundary anomalies increase with the electrical charge per nolecule, and are high for substances with relatively small molecules. The method described may be useful in work on the identification of mixtures of substances with relatively low mol. wts. as these substances give too strong boundary anomalies for the usual electrophoresis. H. H. HO.

537.312 = 4 3015

The physical properties of water of the Black Sea. GHEORGHIU, V. G., AND CALINICENCO, N. *Rev. Gén. Élect.*, 48, *pp.* 107–116, *Aug.*, 1940.

537.312.62 : 532.13 : 536.7 3016

The frictionless state of aggregation. MENDELSSOHN, K. *Proc. Phys. Soc., Lond.*, 57, *pp.* 371–389, *Sept.*, 1945.—The analogy of superconductivity and liquid He II is analysed on an empirical basis. Frictionless transport is considered to be the fundamental phenomenon. It is concluded that the "superconductive" electrons and the "superfluid" He atoms form an aggregate in momentum space of zero thermal energy (*z-state*). The *z-particles* occupy a set of lowest quantum states which is separated from the thermal states by an energy gap; they have zero entropy, but an appreciable zero-point energy. The observed sp. ht. anomalies are due to a lifting of z-particles over this gap. The transport phenomena are caused by a diffusion of z-particles under their zero-point momentum. This zero-point diffusion does not result in dissipation of momentum. It explains why frictionless transport is independent of the strength of external forces and explains also the critical transport rates (threshold value and film transfer). Bose–Einstein condensation fails to account for these characteristic features because it does not lead to a zero-point energy of the condensed phase. A number of experiments to test the hypothesis are suggested.

537.312.62 : 621.318.34 = 3 3017

A persistent-current electromagnet. JUSTI, E. *Elektrotech. Z.* [*ETZ*], 63, *pp.* 577–580, *Dec.* 17, 1942.—[Abstr. 2552 B (1945)].

537.324 : 535.33.072–1 3018

The design and construction of rapid-response thermocouples for use as radiation detectors in infra-red spectrographs. ROESS, L. C., AND DACUS, E. N. *Rev. Sci. Instrum.*, 16, *pp.* 164–172, *July*, 1945.—The thermocouple is made by condensing 600–1 000 Å thick layers of Bi and Sb, which overlap slightly to form the hot junction, on a 400–500 Å thick film of Formvar. This film is stretched over a glass form having an opening under the hot junction, which is blackened with Au evaporated in H_2 at 2–4 mm. Hg. The thermocouple is intended for use with radiation interrupted at frequencies between 1 and 5 c/s. The signal-to-noise ratio of the thermocouple, defined as the ratio of the interruption frequency component of its output to the square root of its resistance, is the criterion of its quality, and in an infra-red spectrograph a single junction thermocouple has a greater signal-to-noise ratio than a multi-junction thermopile. An important operation in the thermocouple construction is the use of a glow discharge before condensation of each metal to reduce the thermocouple resistance by factors of 5 to 10. Such a thermocouple has a resistance of 20–50 Ω, a d.c. sensitivity of 6–7 μV per 10^{-4} W cm.$^{-2}$, and an output under radiation interrupted at 7 c/s of $< 1/2$ the d.c. value.

537.363 : 537.311 *see Abstr.* 3014

537.363 : 577.1 : 532.13 *see Abstr.* 2773

537.363 : 612.11 : 545.8 *see Abstr.* 3117

537.363 : 612.664 3019

Electrophoretic and enzymatic fractionation of casein from human milk. MELLANDER, O. *Nature, Lond.*, 155, *pp.* 604–605, *May* 19, 1945.

537.37 : 621.362 = 4 3020

Experimental laws of the new torsional-electric effect. PERRIER, A., AND AZAD, A. A. *Helv. Phys. Acta*, 17, 6, *pp.* 463–476, 1944.—When a steady temperature gradient is maintained along a nickel or iron cylindrical tube, twisting of the tube sets up an electric current of which the lines of flow are normal to the generating lines of the cylinder. The current may attain an intensity of $^1/_{10}$ A/cm.^{2}/degree. Reversal of the temperature difference or of the direction of twist causes reversal of the current provided that the distortion is within the elastic limit. The effect increases with torsion to a limiting value. [See also Abstr. 3670 (1935)]. G. E. A.

537.525.6 : 537.12 3021

Electron temperatures in electrical discharges. CHAO, K. T., AND TANG, T. Y. *Phys. Rev.*, 68, *pp.* 30–39, *July* 1 *and* 15, 1945.—Electron temperatures in the positive column and in the Faraday dark space of a cold cathode glow discharge were measured by the probe method with gas pressures of dry air and CO of 0·06–1·2 mm. Hg. For the fast group, electron temperatures decrease with pressure while for the slow group they are independent of it. The electron current densities increase and the space potentials decrease when the gas pressure is increased. Different current-voltage characteristic curves were found in the positive column and in the transition region from the negative glow to the Faraday dark space. Theoretical interpretations of these characteristics could be obtained either from Langmuir's theory of probe or from Druyvesteyn's theory of electron energy distribution by assuming the existence in the boundary between negative glow and Faraday dark space of a drift fast electron beam superimposed upon an isotropic slow electron distribution. Spectroscopic investigations of the bands of the neutral and ionic molecules of N_2 and CO in different sections of discharges support the supposition.

537.525.6 = 3 3022

Characteristics of the Townsend discharge and the effect of irradiation of the cathode. MEILI, E. *Helv. Phys. Acta*, 18, 2, *pp.* 79–124, 1945.—The Townsend theory of discharge and its accuracy are considered, and extensions of the theory, in particular, the square-root law, are discussed. The general current density laws are supported by experiments with A, He, Kr, H_2 and N_2. The slope of the first characteristic, K_1, varies with distance at constant π (= pressure × free path) at a rate approaching a square law in certain cases. This is largely, but not entirely due to space-charge effects. Possible reverse processes and their dependence on field strength are considered. The production of electrons at the cathode by positive ion impact is not greatly affected by field strength. Photo-ionization, the action of metastable atoms at the cathode, and back diffusion of electrons are also briefly considered. Back diffusion cannot greatly influence the shape of the γ-curve, though it can affect the cathode field strength relationships. The square-root law has limitations, and is to be regarded rather as applicable to a wide special case. When the characteristics are not decreasing the law does not apply, and two possible cases of this are considered. A. J. M.

537.525.8 3023

Afterglow effects in high-pressure gases. CRAGGS, J. D., AND MEEK, J. M. *Nature, Lond.*, 156, *pp.* 21–22, *July* 7, 1945.—A continuation of previous work [see Abstr. 206 (1944)].

537.525.8 3024

Visible glow discharge at very low potentials. SOMMER, A. *Nature, Lond.*, 156 *p.* 242, *Aug.* 25, 1945.

537.525.83 3025

On the cathode dark-space of a glow discharge in gases at low pressures. CHAUDHURI, R. M., AND ZUBERI, S. H. *Indian J. Phys.*, 18, *pp.* 333–340, *Dec.* 1944.—Experiments were performed with a movable anode in a discharge tube. The tube voltage and current showed no variation as the anode was brought closer to the cathode until the former cut out a certain length of the negative glow. If the anode was pushed further the current decreased while the voltage required to maintain a smaller current rose continuously. The drop in the current was linear with the displacement of the anode until it reached a point near the edge of the cathode dark-space. It is concluded that there is always a supply of the positive ions to the cathode dark-space from the negative glow which is not consistent with Thomson's assumptions.

537.525.92 3026

Neutralization of space-charge of hot metals by positive ions of potassium. CHAUDHURI, R. M., AND AHMAD, A. *Curr. Sci.*, 14, *pp.* 176–177, *July*, 1945.

537.531 3027

Measuring X-rays. MAYNEORD, W. V. *Radiography*, 11, *pp.* 41–48, *June, and pp.* 49–54, *July*, 1945.—An outline of the development of measurement of X-rays, in respect to dosage, etc. Following the barium platinum cyanide pastille, various methods were proposed of which the ionization method became the preferred method. The parallel plate ionoquantimeter and the thimble ionization chamber are described. Wall effects are virtually eliminated. The "Roentgen," defined in 1928, was redefined in 1937. The distribution of X-ray intensity in a plane leads to the development of isodosis curves following which dose distribution in a volume demands consideration of the revolution of an isodosis curve resulting in isodosis contours. Still further consideration has to be paid to the total energy absorption, to determine which the phantom "man" designed by the author is described. Finally, a note of warning is given as to the possible differences between physical and biological results, by illustrating the manner in which electrons can pass via a tissue and affect only relatively few of the tissue cell nuclei. B. J. L.

537.531 : 535.3 : 548.231 3028

Scattering of X-rays in polycrystalline bodies. I–II. BREKHOVSKIKH, L. M. *J. Phys. USSR*, 7, 4, *pp.* 179–191, 1943.—A theory of the scattering is presented in which the thermal vibrations of the atoms are taken into account. A calculation is made of the intensity of the scattering produced by a single grain of a definite orientation. This consists of two terms, the first (called the Laue part) gives the intensity when there is no thermal vibration and the second (the scattered radiation) is due to thermal vibrations alone. The ratio of these two terms, for a polycrystalline body, is

greater than for a single crystal, and the Debye background, which is much more important for a polycrystalline body, depends on the size of the grain in the same way as does the scattered radiation. Some details of the theory are discussed when the thermal vibrations are negligible. In II, the intensity of X-rays scattered by a liquid is found as a function of the angle of scattering, the liquid being regarded as a fine powdered polycrystalline specimen. The theory is compared with experimental data for liquid Na. The agreement is fairly good. L. S. G.

537.531 : 535.338 3029

Theoretical continuous X-ray energy and polarization. KIRKPATRICK, P., AND WIEDMANN, L. *Phys. Rev.*, 67, *pp.* 321–339, *June* 1 *and* 15, 1945.—By the theory of Sommerfeld, relativity effects and retardation of potential being neglected, matrix elements and associated components of continuous spectrum X-radiation are computed for a variety of electron-nucleus collisions and for a distributed series of positions in the spectrum. The calculations cover values of V/Z^2 from 0·06128 to 3·356, where Z is the atomic number of the nucleus, and V is the bombardment potential in electrostatic units. Empirical algebraic formulae are found which closely represent the rigorously calculated results. Intensity and polarization predictions for any direction of emission and any excitation conditions within the range of applicability of the theory may be drawn from the computed results. Theoretical efficiencies of continuous X-ray production are calculated by combining theoretical intensities with known rates of electron energy loss in traversing matter.

537.531 : 535.339 3030

Monochromatic X-radiation. LIPSON, H., NELSON, L. B., AND RILEY, D. P. *J. Sci. Instrum.*, 22, *pp.* 184–187, *Oct.*, 1945.—Various crystals can be used as reflectors for producing monochromatic X-rays and descriptions are given of some of them, together with a list of properties which determine their usefulness for different sorts of investigations. A simple instrument for mounting a crystal is described; its main advantage is its compactness, which ensures that the reflected beam is as intense as possible.

537.531 : 535.343 3031

Structure in the X-ray *K* absorption edges of solid potassium chloride. TRISCHKA, J. W. *Phys. Rev.*, 67, *pp.* 318–320, *June* 1 *and* 15, 1945.—A 2-crystal vacuum spectrometer was used to investigate the K-ray absorption spectrum of KCl over a 50 V range in the vicinity of the *K* edges of both K and Cl. Absorbers were prepared by vacuum evaporation of the salt on to thin, taut Kodapak films. High precision of intensity measurement was made possible by the use of fortuitously located $L\alpha_1$ radiations from targets of Sb and Pd.

537.531 : 535.42 : 539.4 *see Abstr.* 3087

537.531 : 535.42 : 669.74 3032

Effect of hydrogen on the X-ray parameter and structure of electrolytic manganese. POTTER, E. V., AND HUBER, R. W. *Phys. Rev.*, 68, *pp.* 24–29, *July* 1 *and* 15, 1945.—The effect on the average lattice parameter was determined. The parameter varies approx. linearly with the H content. The crystals, composing electrolytic manganese metal, are generally not uniform in parameter but show deviations up to $\pm 0{\cdot}2$ or $\pm 0{\cdot}3\%$. The deviations in parameter between the unit cells of α-Mn in a sample of metal are not $\propto$ the amount of gas in the metal. The effect of various degassing treatments on the parameter and diffraction patterns was determined. The parameters are not effected unless the metal is heated over 300°C. At 500°C. and over, the parameter returns to its normal value and the diffraction lines are sharp. The broadening of the diffraction lines in the patterns for the metal containing gas are attributed to non-uniform lattices in the metal due to non-uniform gas distribution, and the results indicate that Mn may be saturated with H at about 695 cm.^{3}/100 g. of metal. Mn metal with normal lattice parameters and uniform structure may be obtained from electrolytic metal by removing the gas and heating it to 500°C. for 1 hr.

537.531 : 778.3 : 61 3033

An analysis of the physical factors controlling the diagnostic quality of Roentgen images. MORGAN, R. H. *Amer. J. Roentgenol. and Radium Ther.*, 53, *pp.* 128–135, *Aug.*, 1945.—The diagnostic value of radiographs is determined by their clarity and detail. Knowledge of the various factors involved is desirable particularly since opinion varies, some radiologists claiming the radiographic value is dependent upon the kilovoltage exciting the X-rays in relation to the particular body tissue and others stating the kilovoltage does not affect the result. Ability of a film to record detail is dependent on its power of resolving thin lines, such resolution being determined by the size of grain of the film emulsion. A test mandrel to determine resolving power, made of wires of known graduated thicknesses, is described and illustrated. A series of papers intended further to pursue the question is to follow and the present paper is largely devoted to the mathematical basis underlying these further proposed papers. B. J. L.

537.531 = 4 3034

Analysis of complex X-rays by means of filters. SERVAIS, M. *Bull. Soc. Franç. Élect.*, 5, *pp.* 205–220, *July*, 1945.—An experimental study of the intensity of X-rays transmitted by different thicknesses of aluminium, with different anti-cathodes and tube voltages. Thin and thick filters are discussed, and a theory is given, based on variation of absorption coefficient with wavelength. N. C.

537.531.8 3035

Auger electrons resulting from *K*-capture. MILLER, F., JR. *Phys. Rev.*, 67, *pp.* 309–312, *June* 1 *and* 15, 1945.—The most intense group of Auger electrons due to X-rays associated with *K*-capture in Zn^{65} would have energies lying in a narrow band within about 300 eV of a max. value of 7 056 eV (*Hp*284). These would arise from $K - L^2$ transitions in the resulting Cu atom. Electrons from the $K - LM$ transitions would be about $^1/_3$ as numerous, lying within about 300 eV of a max. value of 8 016 eV ($H\rho$302). The soft electrons which are emitted copiously from Zn^{65} were found to have an absorption limit in collodion of $0{\cdot}15 \pm 0{\cdot}03$ mg./cm.^{2}, approx. 7 500 eV. When samples were placed 0·6 to 1·3 cm. from the screen of a screen wall-counter filled with H_2 at 2 cm. Hg pressure, the upper limit (by inspection) was found to

be at $H\rho 302 \pm 30$ (8 000 ± 1 700 eV). Scattering in the counter gas and absorption in the sample are believed negligible. These data are consistent with the hypothesis that the soft electrons from Zn^{65} are Auger electrons resulting from *K*-capture.

537.531.9 : 578.088.5 = 3 3036

Radio-biological investigations with soft X-rays. HARDUNG, V. *Helv. Phys. Acta*, 18, 1, *pp.* 45–71, 1945.—Theoretical considerations of X-ray therapy on bacilli are compared with experimental results with B. coli, B. proteus and B. pyocyanus. It would appear that with equal dosage but a variable tube voltage and variable energy distribution the destruction rate remains constant or, at a certain tube voltage, declines. The results are, however, inconclusive. B. J. L.

537.533.1 3037

A new occurrence of the electronic phase velocity. BENHAM, W. E. *Nature, Lond.*, 156, *pp.* 204–205, *Aug.* 18, 1945.—Commencing with the Lorentz equation of motion of an electron in an electromagnetic field it is shown that a conservation of the energy leads to $m\dot{v} + e\dot{A}/c = 0$ where v is the velocity and A is the vector potential. From this it is concluded that non-trivial solutions of $\Delta\dot{A} + \dot{v}A/c^2 = 0$ exist. These solutions lead to the concept of *A*-waves and some properties of these waves are examined. L. S. G.

537.533.72 3038

Electron shadow-micrographs of haemocyanin molecules. WILLIAMS, R. C., AND WYCKOFF, R. W. G. *Nature, Lond.*, 156, *pp.* 68–70, *July* 21, 1945.

537.533.72 : 539.26 : 621.352.7.035.222 3039

X-ray and electron microscope evaluation of carbon blacks. MRGUDICH, J. N., AND CLOCK, R. C. *Trans. Electrochem. Soc.*, 86, *pp.* 351–364, 1944.

537.533.72 : 591.86 *see Abstr.* 3138

537.533.72 : 61 3040

The electron microscope: its application to medicine. DONOVAN, G. E. *Proc. R. Soc. Med.*, 37, *pp.* 708–716, *Oct.*, 1944.—The history, development and characteristics are outlined. Most of the 29 papers cited are from journals not usually examined by physicists. Previous work seems to have been directed towards the discovery of possible fields of research rather than to the solution of particular problems. Amongst the applications mentioned are the study of dusts, smokes, the metabolism of the bacterial cell, viruses, and the disproof of the macromolecular nature of bacteriophages. The bombardment of specimens with high-speed electrons produces changes in protoplasm and in molecules, and entomologists have remarked a shrinkage, evolution of gas, discoloration and increased friability of their specimens. Electron stereomicroscopy has been suggested as well as the possibility of viewing single atoms; but the exposure time would have to be increased by $>$ 1 000 times if ultramicroscopical methods were to be introduced. C. J. G.

537.533.72 : 621.352.7.035.222 3041

Microscopic and diffraction studies on dry cells and their raw materials. MCMURDIE, H. F. *Trans. Electrochem. Soc.*, 86, *pp.* 313–326, 1944.—A study of the manganese dioxides and other crystalline materials in a dry cell has been made and five different crystal varieties of MnO_2 identified. Examination of the oxides by the electron microscope revealed great differences in particle size and shape. Prismatic crystals of $Zn(NH_3)_2Cl_2$ were found in the pastes of undischarged cells, while $ZnCl_2 . 4Zn(OH)_2$ occurred in small hexagonal plates in the pastes of discharged cells. X-ray diffraction studies of thoroughly discharged mixes indicate that the MnO_2 of a dry cell is reduced by discharge to the double salt, $ZnO . Mn_2O_3$ (heterolite).

537.533.73 3042

Refraction effects in electron diffraction. STURKEY, L., AND FREVEL, L. K. *Phys. Rev.*, 68, *pp.* 56–57, *July* 1 *and* 15, 1945.

537.533.73 : 539.2 = 4 *see Abstr.* 3073

537.533.74 = 4 3043

Diffusion of rapid electrons through lead nuclei. DU PASQUIER, P. *Helv. Phys. Acta*, 17, 6, *pp.* 409–428, 1944.—The diffusion of electrons of energy 1–3 eMV in $Pb(CH_3)_4$ vapour has been investigated using a Wilson chamber. Possible errors are considered, and the observed rate of diffusion was found to agree satisfactorily with theory, contrary to results obtained by Barber *et al.* with Hg. Recent determinations do not confirm anomalies formerly observed, and it is concluded that the diffusion of electrons through both heavy and light elements is normal. It is not necessary to introduce supplementary action between the electrons and the nucleus, the Coulomb force being sufficient to explain the observed diffusion. The varying results of Massey, and of Mott and Urban, where the angular distribution above 60° differs widely from theory, are discussed. A. J. M.

537.533.8 : 666.112.7 3044

The secondary electron emission of Pyrex glass. MUELLER, C. W. *J. Appl. Phys.*, 16, *pp.* 453–458, *Aug.*, 1945.—The total secondary emission was measured by a method using the conductivity of the heated glass to carry the current. Necessary precautions are pointed out. The emission was measured over the bombarding voltage range of 50–10 000 V. No temperature variation of secondary emission was observed.

537.534.74 3045

Proton-proton scattering at low velocity. KAR, K. C., AND MITRA, S. N. *Indian J. Phys.*, 18, *pp.* 303–305, *Dec.*, 1944.—It is shown that Kar's formula explains the angular variation of the departure from Mott's formula as observed by Ragan and others for low velocities, if it is assumed that the short range Yukawa force is due to the formation of mesons having mass 152 e.u. and short range charge $^1/_2$ or other submultiple of its mass. The mass thus determined is different from the mass 110 e.u. obtained previously by applying Kar's formula to high velocity proton-proton scattering. [See Abstr. 404 (1943)].

537.54 : 535.62 = 4 *see Abstr.* 2956

537.54 : 539.17 *see Abstr.* 3071

537.543 : 621.3.032.21 3046

Design of a pool-type cathode for an arc operating at low currents. COPELAND, P. L. *Rev. Sci. Instrum.*, 16, *p.* 154, *June*, 1945.

37.56 : 523.87 *see Abstr.* 2718

37.564 3047

The electric breakdown and cumulative ionization. AVYDOV, B. *J. Phys., USSR*, 7, 4, *p.* 196, 1943.—he number of free electrons per unit volume, obtained as a result of impact ionization in a gas, placed in a homogeneous electric field, is determined by the alance between ionization and recombination rocesses. Only 2 excited levels between the ground vel and the continuous spectrum are considered.

L. S. G.

37.564 = 4 3048

Ionization of air by electrified dielectrics. PERRIER, *Ann. Phys., Paris*, 14, *pp.* 5–77, *July–Dec.*, 1940.—he mode of discharge of insulators (amber, sulphur nd paraffin) electrified by friction was investigated sing more sensitive apparatus. The advantages of an lectrometer over a triode method are discussed. he construction of a suitable ionization chamber hich would be sensitive, yet unaffected by external lectrostatic disturbances is described. The effect of ntroducing a dielectric, charged or not, into the onization chamber was studied. Air is ionized by the ielectric when it is discharged. The absorption coeff. n air and in celluloid of the radiation produced was etermined. The coeffs. for cellophane, celluloid and ollodion are the same, showing that the absorption is ndependent of the molecule, but depends on the toms present in the absorber. The wavelength of he radiation $\simeq$ 20 Å, and does not depend much on he nature of the dielectric. The relations between he frequency and the density, hardness, and permittivity of the dielectric were investigated, and it is hown that a simple relationship exists between the requency and permittivity. The emission of the adiation is considered on the basis of the quantum heory. A. J. M.

37.57 : 532.7 *see Abstr.* 2807

537.591 3049

On the variation in the experimentally determined alues of the meson mass. BOSE, D. M., AND CHOUDHURI, B. *Indian J. Phys.*, 18, *pp.* 285–292, *Oct.*, 1944.—All reliable data on meson mass determinations are collected and the assumptions underlying the different experimental methods as well as their reliability are discussed. Large variations in the meson mass values occur, both when different experimental methods are used and when the same method is used by different observers. It is probable that apart from the large errors of measurements associated with the present methods of meson mass determinations, the variation in mass values depends also, in some way not representable by the relativity formula, on the velocity of the meson particle. Possible causes of such variations are discussed.

537.591 3050

Energy spectrum of mesotrons at low energies. GHOSH, S. K., AND DAS GUPTA, N. N. *Nature, Lond.*, 156, *pp.* 83–84, *July* 21, 1945.—Information regarding the low-energy part of the mesotron spectrum is obtained from analysis of the absorption curves of cosmic rays in Pb and H_2O.

537.591 : 530.12 3051

Cosmic rays and kinematical relativity. HALDANE, J. B. S. *Nature, Lond.*, 156, *p.* 266, *Sept.* 1, 1945.

537.591 : 539.152.1 3052

Cosmic rays. Anglo-French Conference in Bristol. *Nature, Lond.*, 156, *pp.* 543–544, *Nov.* 3, 1945.

537.591.15 3053

Cosmic radiation observed at the Col du Lautaret, Hautes-Alpes. DAUDIN, J. *Nature, Lond.*, 156, *pp.* 420–421, *Oct.* 6, 1945.

537.591.3 3054

Absorption of cosmic rays at Colombo and London. GEORGE, E. P., AND APPAPILLAI, V. *Nature, Lond.*, 155, *p.* 726, *June* 16, 1945.

538.082.74 : 621.317.44 3055

Mercury jet magnetometer. KOLIN, A. *Rev. Sci. Instrum.*, 16, *pp.* 209–214, *Aug.*, 1945.—Hg is allowed to flow through a narrow non-conducting pipe provided with two pick-up electrodes at the ends of a diameter. In the presence of a magnetic field an e.m.f. is induced in the moving Hg. The p.d. detected between the electrodes is due to the component of the local magnetic field perpendicular to the pipe axis and to the diameter along which the electrodes are located. The device permits the establishment of the direction of the local field without introduction of a ferromagnetic body which might distort it. The magnetic field intensity in a sharply localized region can be determined. The instrument gives a direct reading $\propto$ the magnetic field intensity and permits study of both const. and rapidly varying transient fields. Fields of <1 oersted can still be easily detected. The magnetic field can be measured absolutely. Two ways of propelling the Hg are described. One uses gravity, and in the other electromagnetic forces exerted upon a liquid conductor in a magnetic field are used.

538.111 : 531.51 3056

A classical theory of electromagnetism and gravitation. CORBEN, H. C. *Nature, Lond.*, 156, *pp.* 388–389, *Sept.* 29, 1945.

538.12 3057

The magnetic field inside a ferromagnet. WANNIER, G. H. *Phys. Rev.*, 67, *p.* 364, *June* 1 *and* 15, 1945.—Discussion of the relation between the average magnetic field b for a fast charged particle traversing a magnetized iron bar, the field h which would exist if the electrons were true magnetic dipoles, and M the magnetization, leads to the formula $b = H + 2\pi(p+1)M$ or $b = B + 2\pi(p-1)M$, where p is a numerical factor equal to the relative probability of coincidence of test charge and electron as compared to randomness. This formula gives a field larger than B for positive charges and smaller than B for negative charges. From an experimental point of view, the most hopeful feature for a check is the assymmetry of the equations for positive and negative charges. Positive particles should be deflected more under otherwise similar circumstances, provided their speed is not $\gg 5 \times 10^9$ cm./sec. Relativistic modifications of the formulae are being investigated. A. W.

538.122 : 538.311 3058

Directional loci in a magnetic field, and the locating of neutral points. OWEN, D. *Proc. Phys. Soc., Lond.*, 57, *pp.* 294–301, *July*, 1945.—A method of exploration of a magnetic field by means of directional loci is described. The points of intersection of any two loci are neutral points. The method is exemplified in the

simpler cases of the combination of the earth's field with the field of a bar magnet and with the field of a circular current.

538.214 3059

The diamagnetic susceptibility of some alkyl and aryl halides. FRENCH, C. M., AND TREW, V. C. G. *Trans. Faraday Soc.*, 41, *pp.* 439–449, *Aug.–Sept.*, 1945.—Modifications are described in the Gouy method of measuring magnetic susceptibilities in precision work with liquids. The suitability of various substances for use as standards is discussed, and the advantages of agreement among different workers on a common substance for this purpose, with an accepted susceptibility value is stressed. The susceptibilities of various alkyl and aryl halides are given, and a theoretical discussion on the significance of the results follows. It is shown that there is an increasing divergence between the experimental susceptibility values and the theoretical values calculated by any of the different methods available, with increasing number of halogen atoms in the molecule.

538.214 : 538.662.12 3060

Effect of temperature on magnetic susceptibility of molybdenite crystals. DUTTA, A. K. *Nature, Lond.*, 156, *pp.* 240–241, *Aug.* 25, 1945.

538.24 3061

Demagnetizing factors of the general ellipsoid. OSBORN, J. A. *Phys. Rev.*, 67, *pp.* 351–357, *June* 1 *and* 15, 1945.—Charts and tables are given which make possible a determination of the demagnetizing factor for any principal axis of an ellipsoid of any shape. Formulae for the demagnetizing factors of the general ellipsoid are included together with supplementary formulae which cover a large number of special cases.

538.311 : 538.122 *see Abstr.* 3058

538.56 : 517.564.3 : 621.396.616 : 621.385.8 3062

Electromagnetic field inside a cylinder with a gap. WANG, C. C. *J. Appl. Phys.*, 16, *pp.* 351–366, *June*, 1945.—Equations are obtained which completely specify the electric and magnetic field strength in the cylindrical space in terms of the average axial electric field at the gap. Curves are calculated, by means of these equations, for the relative field strength at various points inside the cylinder. Equivalent capacitance due to the energy stored in the cylinder may be calculated and used for estimating the resonant frequency of the cavity. The equations are degenerated to apply to an electrostatic lens, the potential distribution being obtained in this case.

L. S. G.

538.566 = 4 3063

Electromagnetic vibrations in ellipsoidal cavities. JOUGUET, M. *Bull. Soc. Franç. Élect.*, 5, *pp.* 52–58, *Feb.*, 1945.—Maxwell's equations are solved for such cavities, the field distribution for both the electric and the magnetic types of vibrations being obtained. The general solution involves Mathieu functions, but a special case, studied in some detail, can be treated with circular functions. General integral formulae are given for the losses in the cavity. L. S. G.

538.615 : 535.338.3 *see Abstr.* 2895

538.615 : 535.34 *see Abstr.* 2909

538.662.12 : 538.214 *see Abstr.* 3060

538.69 306

Rotation of electrolyte between insulated poles magnet. PERLS, T. A. *Science*, 102, *pp.* 45–4 *July* 13, 1945.

538.71

The Gulf absolute magnetometer. VACQUIER, *Terr. Magn. Atmos. Elect.*, 50, *pp.* 91–104, *June*, 194 —The declination is measured by means of a fibr suspended magnet. The intensity-measurements a made by comparing the field of a Helmholtz coil wit the component of the Earth's field that is to b measured. H is obtained by the sine-galvanomete method. The zero-field detecting device for Z is special vertical field-balance in which the polarity c the magnet can be reversed by discharging a capacito through magnetizing coils fastened to the case. Th effect of residual mechanical unbalance is thus mad to disappear from the average of two sets of observa tions taken with the magnet oppositely polarized. Th Helmholtz coil-constant for the Z-magnet is dete mined by suspending the Z-magnet in the sin galvanometer housing, and comparing the value of I so obtained with an observatory base-line.

539.13 : 530.145.6/.7 *see Abstr.* 2748

539.152.1 306

A classification of stable nuclei. KURBATOV, J. D *J. Phys. Chem.*, 49, *pp.* 110–150, *March*, 1945.—Th physical characteristics of nuclei, such as spin an magnetic moment, are used as criteria for the identifica tion of a series of nuclei in a classification which cover all mass numbers. The isotopic numbers of nucl belonging to the same series are a continuous odd o even sequence. Nuclei of the same isotopic numbe of a series form a group which differ by 2 protons an 2 neutrons. The mass number of the last nucleus o a group must not be higher than that of the firs member of the next group. The differences i isotopic numbers between groups are equal an remain constant in a series. Only 3 nuclei, od isobars, of which the stability is in doubt, could no be classified. A. J. M

539.152.1 : 530.145.63 *see Abstr.* 2749

539.152.1 : 537.591 *see Abstr.* 3052

539.153 : 535.33 306

Variational energies of anomalous states of 2- an 3-electron configurations of light atoms. WU, T. Y. AND SHEN, S. T. *Chinese J. Phys.*, 5, *pp.* 150–161 *Dec.*, 1944.—The energy states of the configuration $2s2p$, $2p^2$, $1s2s2p$, $1s2p^2$, $2s2p^2$, $2p^3$ and $1s^22s^2$ in th atoms from H to F are calculated by the variationa method using simple wave functions. The energie are corrected, where possible, by Stevenson's metho [Abstr. 4333 (1939)]. The calculated energies are use to identify the "satellite" lines observed by Edlén an Tyrén (*Nature, Lond.*, 143, p. 940, 1939) in the CV and CVI-like spectra. The possibility of stabl negative ions of H and He in excited states is dis cussed. The electron affinity of Li atoms is estimated L. S. G

539.155.2 : 665.5 3068

The relative abundance of the carbon isotopes in petroleum. WEST, S. S. *Geophysics*, 10, *pp.* 406–420 *July*, 1945.—Measurements were made in samples o oil and gas from 35 wells in the U.S.A., and in surface

getation, hydrocarbons from well cuttings, and CO_2 sorbed from soil. For the samples from Silica nd Ellinwood Fields, $C^{12}/C^{13} = 94{\cdot}1 \pm 0{\cdot}4$. Relative undance appears to be independent of the source of troleum, but is about 1·6% lower for vegetation. is concluded that this quantity cannot be used to stinguish sources of petroleum and that its use to termine the origin of soil hydrocarbons requires an curacy of measurement not hitherto attainable.

39.16.08 : 535.215 *see Abstr.* 2858

39.16.08 : 539.185 *see Abstr.* 3072

39.16.08 : 612.2 3069

An atmospheric pressure Geiger–Müller counter stem for the study of respiratory problems. BROWN, C., GOOD, W. M., AND EVANS, R. D. *Rev. Sci. strum.*, 16, *pp.* 125–129, *May*, 1945.—Continuous dioactivity measurements have been made on spiration by using the respired air as the filling gas a Geiger–Müller counter. Two similar counters e used. One is a control for the voltage supply nd contains a strong source of Ra–D. It is always nning at its threshold, independent of the changes f its threshold voltage. The measuring counter perates under a fixed voltage above its threshold. voltage plateau for the counters is unnecessary. he method can be applied to measure the relative oncentration of binary gas mixtures, and to problems f gas flow. A. J. M.

39.166.9 : 576.3 : 615.84 3070

A quantitative analysis of the effect of gamma radiation on malignant cells *in vitro* and *in vivo*. LASNITZKI, . *Brit. J. Radiol.*, 18, *pp.* 214–220, *July*, 1945.—he exposure to a small dose of γ radiation was made n order to determine how an intact circulation nfluences the effect of radiation. In both cases the ffect of radiation on the inhibition of mitosis, on the roduction of abnormal mitotic figures and on the ccurrence of cell degenerations was qualitatively imilar. The effect on the inhibition of mitosis and n the production of degenerate cells was quantitatively of the same order. The effect on cells dividing uring exposure and on the increase in abnormally ividing cells was more marked *in vivo*. The recovery ollowing irradiation was more rapid *in vivo*.

39.17 : 537.54 3071

Arc-ion source with direct-current filament supply for 60-inch cyclotron. COWIE, D. B., AND KSANDA, C. J. *Rev. Sci. Instrum.*, 16, *pp.* 224–225, *Aug.*, 1945.—A capillary arc-ion source for a 60 in. cyclotron is lescribed using a d.c. filament supply. This permitted 30 hr. filament life with large deuteron beams. Stability of the arc and its operating conditions and construction are indicated.

539.185 : 539.16.08 3072

Radioactivity of the neutron. WANG, K. C. *Nature, Lond.*, 155, *p.* 574, *May* 12, 1945.

539.2 : 537.533.73 = 4 3073

Contribution to the study of molecular structures by electron diffraction. ROUAULT, M. *Ann. Phys., Paris*, 14, *pp.* 78–147, *July–Dec.*, 1940.—One of the difficulties in determining molecular structures by comparison of experimental and theoretical electron diffraction curves is due to the absence of maxima and minima in the function I(*s*) representing the distribution of the intensity of the diffracted electrons as a function of the angle of diffraction. It is shown that among the functions bearing a simple relation to I(*s*), s^3I(*s*) is the one which generally presents the sharpest maxima and minima and that it suffices to compare the abscissae of the maxima and minima of the experimental and theoretical s^3I(*s*) curves in order to obtain the distances of the atoms constituting the molecule studied. This method gave a good value for the distance C–Cl in CCl_4, using the second max., and also for PCl_5 and $SbCl_5$, using the first max. From the experimental results on these two substances it is concluded that in the gaseous state the molecules take the form of a triangular bipyramid, the 5 corners being occupied by the 5 atoms of Cl, with the P or Sb atom at the centre, and that there are probably two distances of the central atom from the Cl atoms, the ratio being about 1·05. The bipyramidal form is in agreement with the Raman spectrum for liquid PCl_5 and the existence of two distances P–Cl or Sb–Cl is in agreement with Pauling's theory on the homopolar connections of atoms such as P or Sb. A. W.

539.2 : 548.7 : 536.71 : 530.145 *see Abstr.* 2743

539.211 : 548 : 535.417 *see Abstr.* 2948

539.214 3074

On the pseudo-plastic state. DEUTSCH, W. *Phil. Mag.*, 36, *pp.* 115–121, *Feb.*, 1945.—A simple explanation is given of the mechanical behaviour of a substance in the pseudo-plastic state, use being made of Maxwell's law of relaxation in connection with the geometry of the pure elastic state in the body. The idea of shearing by jerks [*Naturwiss.*, **10**, 661 (1938)] is used as the basis of a theory in which formulae are developed for the viscosity. A comparison is made with experiment and there is an application to certain types of oils. L. S. G.

539.216.1 : 677.3 3075

An analysis of the irregularities in worsted yarns and slivers. WAGGETT, G. *J. Text. Inst., Manchr*, 36, *pp.* T131–146, *June*, 1945.—The irregularities in a range of worsted yarns are examined for composition of fibre length and the results explained by fibre movement during drafting. It is shown that greater unevenness in the yarns corresponds to a greater irregular disposition of the various lengths of fibre.

539.217 : 621.798.15 *see Abstr.* 3139

539.217.1 : 536.25 *see Abstr.* 2973

539.217.1 : 669.016 : 620.172 3076

The properties of some magnesium–aluminium–zinc casting alloys and the incidence of microporosity. FOX, F. A. *J. Inst. Met.*, 71, *pp.* 415–439, *Aug.*, 1945.—[Abstr. 2356 B (1945)].

539.217.3 3077

Permeability of keratin membranes to water vapour. KING, G. *Trans. Faraday Soc.*, 41, *pp.* 479–487, *Aug.–Sept.*, 1945.—The rate of diffusion of water vapour through a keratin membrane is investigated over a range of vapour pressure gradients, and at different temperatures. The results show that the diffusion coefficient is a function of the water concentration, and the temperature, and that it is independent, to a large extent, of the elasticity of the keratin lattice. A theory of sorption is applied to the

experimentally derived relation. An appendix to the paper explains quantitatively the apparent reduction in permeability of the membrane due to residual air in the "high pressure" side of the system.

539.26 : 541.182.5 *see Abstr.* 3108

539.26 : 621.315.626 3078

The X-ray examination of laminated plastics. BARKER, H. *Machinery, Lond.*, *pp.* 677–680, *June* 21, 1945.—The use of X-ray equipment in the control of the manufacture of high voltage bakelized paper bushings and other laminated-plastic articles is described. A visual X-ray inspection of all capacitor bushings up to 33 kV working voltage is made. For bushings above this voltage, radiographs are taken so that more detailed examination, accompanied by actual measurements of layer position, is possible. The control of X-ray scatter and protection of the operator are discussed. M.-V.

539.26 : 621.352.7.035.222 : 537.533.72 *see Abstr.* 3039

539.262 3079

An automatic precision space-indicating X-ray back-reflection instrument. CARAPELLA, L. A., AND KAISER, H. F. *Rev. Sci. Instrum.*, 16, *pp.* 214–216, *Aug.*, 1945.—A new automatic instrument for rapid, precise determination of X-ray back-reflection lattice spacings is described. The instrument is a precision back-reflection focusing camera containing a Geiger–Müller counter, a pin-hole collimator system, and a movable X-ray disc baffle with a special circular slit system. Once the instrument is calibrated, the lattice spacings are measured by the position of the slit system on the disc which in itself is part of a simple micrometer measuring device.

539.262 : 621.386.12 3080

The design of X-ray powder cameras. BUERGER, M. J. *J. Appl. Phys.*, 16, *pp.* 501–510, *Sept.*, 1945.—[Abstr. 2622 B (1945)].

539.264 : 612.75 = 4 3081

The sub-microscopic study of human bone by X-ray diffraction. LAMARQUE, P., AND MERING, J. *J. Radiol. Électrol.*, 25, 11, *pp.* 201–205, 1942–1943.—Normal bone consists of a colloid component and a mineral component. The colloid is a proteid having chains of polypeptides, acting as an enormous molecule. This colloid is named "osseine" and, heated to 120°C., gives gelatine. The mineral components are calcium phosphates of the apatite group and are in a sub-microscopic crystalline condition. Macroscopic and microscopic study define the varieties of bone as embryological, spongy and compact bone. Micro-scopic study of these tissues is limited and in consequence molecular diffraction X-ray investigation has been employed. Results obtained by the authors respecting the orientation of the colloid and mineral components, are detailed and illustrated by Laue spectrographs; the former component determines the orientation of the latter. B. J. L.

539.31 : 625.2 : 531.3 *see Abstr.* 2755

539.319 3082

Tension of semi-infinite plate with notched boundary. STEVENSON, A. C. *Phil. Mag.*, 36, *pp.* 178–183, *March*, 1945.—The boundary is identical with one used recently by Dean [Abstr. 1762 (1944)] in a hydrodynamic problem. The displacements and stresses are expressed in terms of the complex potentials [Abstr. 827 (1944)] and the latter are found explicitly. The peripheral stress is calculated in detail. L. S. G.

539.319 308

Stresses in an infinite plate due to isolated forces and couples acting near a circular hole. SEN, B. *Phil. Mag.*, 36, *pp.* 211–216, *March*, 1945.—The stresses are found when either a force in the plane of the plate or a couple with its axis perpendicular to it, acts at a point outside the hole, not far away from the centre. The method is the same as that used previously [Abstr. 3499 (1938)]. L. S. G.

539.32 308

Coefficient of restitution of coals. CANNON, C. G. AND GEORGE, W. H. *Nature, Lond.*, 155, *pp.* 787–788, *June* 30, 1945.

539.32 : 548.0 *see Abstr.* 3122

539.32 : 678 308

Measurement of the modulus of sheet rubber by means of indentation tests. MULLINS, L. *Paper Maker*, 109, *pp.* 39–40*TS*, *June*, 1945.—An expression is derived enabling the Young's modulus (E) to be calculated from hardness measurements obtained by any constant load instrument employing a ball indentor; it is only a first approximation for spring loaded instruments. Factors affecting the accuracy of indentation tests are discussed. The use of blunt indentors and a dead load are preferable to a pin indentor and spring loading, respectively; the period of loading should be specified; the existence of a "grain" in the rubber will cause divergence from the general equation; and the value of E calculated from the hardness measurement depends on the thickness of the sample. If the samples used are too small, changes in lateral dimension occur, which affect the measurements. Lubrication of the surfaces facilitates the spread of the sample and, so reduces the sensitivity of the method to variations in thickness. J. G.

539.386 308

The effect of transverse shear deformation on the bending of elastic plates. REISSNER, E. *J. Appl. Mech.*, 12, *A69–A77*, *June*, 1945.—A system of equations is developed for the theory of the bending. The general solution of the system is obtained in terms of two plane harmonic functions and one function which is the general solution of the equation $\Delta\psi - (10/h^2)\psi = 0$. It is applied to the problem of torsion of a rectangular plate and to the problems of plain bending and pure twisting of an infinite plate with a circular hole. The results obtained differ in some respects from those given by classical plate theory, and it is suggested that the present theory may profitably be applied to other problems where the divergence from the results of classical theory are of interest. L. S. G.

539.4 : 537.531 : 535.42 308

Study of internal stress in a metal by X-ray diffraction. WOOD, W. A. *Proc. Instn Mech. Engrs, Lond.* 152, 2, *pp.* 232–233, 1945.—The effect of stress on internal atomic structure is a change in the interatomic spacings, and the method provides a technique for determining these spacings and, if the modulus is

own, for estimating the equivalent stresses. Only ects associated with elastic deformation are con-lered, and the principles of the method are ex-ined. Stress-strain curves for the atomic lattice e given, and the observed change is related to the uivalent stress. The method gives the internal ess in the surface of a specimen, and it is non-structive. G. E. A.

9.4 : 666.3 3088

Factors which influence the mechanical strength of yware. WEBB, H. W. *Chem. and Ind.*, 23, *pp.* 178–2, *June* 9, 1945.—Properties of clayware such as asile or compressive strength, impact strength and rdness, are considered with respect to the two oad types of wares, viz. (1) those made direct from tural clays as mined or quarried, e.g. bricks or ofing tiles, and (2) those made from selected natural ys to which ground materials such as Cornish stone, spar, flint, or other materials have been added to cure some particular attributes in the fired body. rthenware, porcelain, and china are in this class. nong the factors considered which influence echanical strength are (*a*) grain size, since vitrification important in relation to mechanical strength, and r which data are given for wares made by plastic, mi-plastic, and dust pressed methods; (*b*) straight-ss in firing; (*c*) surface texture; and (*d*) speed of oduction. As a result of firing, the resultant ware s a certain range of porosity, and this is considered length. A more fundamental factor discussed in lation to mechanical strength, which develops during ing, is the change of free quartz into other modifica-ons of silica. Crack phenomena are dealt with, and e paper concludes with a brief theoretical treatment the subject. H. H. HO.

9.4 : 679.56 *see Abstr.* 3145

9.4.016.3 : 679.5 *see Abstr.* 3144

1.12.011.4 3089

The kinetics of the thermal decomposition of gaseous ramethyl-tin. WARING, C. E., AND HORTON, W. S. *Amer. Chem. Soc.*, 67, *pp.* 540–547, *April*, 1945.—he thermal decomposition of $SnMe_4$ has been vestigated between 440 and 493° over a range of 185 mm. initial pressure. From the values of the lf-life periods, times for a given fractional pressure crease and the initial rates, the reaction was found be predominantly of the first order above 80 mm. itial pressure. At lower initial pressures, second rder is approached. The specific velocity constant of ne primary process was $k_0 = 8{\cdot}32 \times 10^{21} e^{-82400/RT}$. he reaction was homogeneous when the reaction ssel was coated with a deposit of Sn and C. NO aused no inhibition but a slight catalytic acceleration f the primary process. The predominant gaseous oducts of the decomposition is CH_4, with some $_2$ and C_2H_4. Sn and C are deposited on the walls. he changes in activation energy in going from Me Et to Pr tetra-alkyls are explained. W. R. A.

41.121 : 535.343 : 536.7 *see Abstr.* 3001

41.123 : 531.732 = 3 *see Abstr.* 2765

41.123.31 3090

The system sodium carbonate–sodium borate–water t 35°. HILL, L. M. *J. Chem. Soc.*, *pp.* 476–478, *uly*, 1945.—This ternary system has been studied at 35° in order to find out if compound formation occurred between the carbonate and the borate. No compounds were observed in contact with solutions containing less than 20% of the carbonate, and beyond this point the system became quaternary with the formation of a solid containing sodium hydrogen carbonate, i.e. sesquicarbonate ($Na_2CO_3 . NaHCO_3 . 2H_2O$).

541.124 3091

The effect of nitric oxide upon the biacetyl-promoted thermal decompositions of acetone and acetaldehyde. KLUTE, C. H., AND WALTERS, W. D. *J. Amer. Chem. Soc.*, 67, *pp.* 550–554, *April*, 1945.—The thermal decompositions of Me_2CO and MeCHO, each containing 1 wt.% of biacetyl, were investigated at 523° and 495°, respectively, in the presence of >0·1 mm. NO. NO fails to suppress the major portion of the biacetyl-promoted decompositions of Me_2CO and MeCHO. Pressures of NO from 0·5 to 12 mm. do not inhibit the thermal decomposition of biacetyl at 437°. Biacetyl-promoted decomposition of Me_2O is suppressed almost completely by NO. W. R. A.

541.124 3092

Reaction of methylene chloride and other halide vapours with sodium. SAFFER, A., AND DAVIS, T. W. *J. Amer. Chem. Soc.*, 67, *pp.* 641–645, *April*, 1945.—C, H, and CH_4, with smaller amounts of C_2H_6, C_2H_4 and C_2H_2 are the main products when CH_2Cl_2 or $CHCl_3$ is passed into molten Na over a wide range of temp. and pressure. A series of reactions between free radicals adsorbed in an activated state on the surface of the metal is suggested as source of the products. W. R. A.

541.124.7 : 577.15 3093

The mode of action of sulphonamides. Dissociation constants of the enzyme-drug complex. KLOTZ, I. M., AND GUTMANN, H. R. *J. Amer. Chem. Soc.*, 67, *pp.* 558–562, *April*, 1945.—The rates of growth of *E. coli* have been followed in the presence of sulphanilamide, sulphathiazole, sulphapyridine and N¹-benzoylsulphanilamide. Analysis of the growth curves indicates that competitive inhibition is obtained in each case. Dissociation constants for the enzyme drug complexes are calculated and their relation to bacteriostatic activity discussed. W. R. A.

541.126 3094

The mechanism of spark ignition. LINNETT, J. W., RAYNOR, E. J., AND FROST, W. E. *Trans. Faraday Soc.*, 41, *pp.* 487–498, *Aug.–Sept.*, 1945.—The effect of added gas on the limiting ignition pressure of electrolytic gas is studied. Small amounts of the added gas aid ignition but larger quantities hinder ignition. It is concluded that the first effect at low pressures results from the added gas preventing the diffusion of active chain propagators from the region of the spark, thus aiding the build-up of explosive conditions in this region. The second effect at higher pressures seems to result from the cooling effect of the added gas and it is concluded that the limiting factor here is a thermal one. The limiting factor in ignition by the spark in the present experiments therefore changes from what may be called a chain factor to a thermal factor on passing from pressures of about a fifth of an atmosphere to pressures of about a half of an atmosphere.

541.127 3095

Determination of equilibrium constants for butanes and pentanes. PINES, H., KVETINSKAS, B., KASSEL, L. S., AND IPATIEFF, V. N. *J. Amer. Chem. Soc.*, 67, *pp.* 631–637, *April*, 1945.—The isomerization equilibria for butane and pentane have been studied under conditions of only slight side reactions. Butane results agree with previous equilibrium determinations, and are given by $R \log K_G^o = (2\,318/T) - 4{\cdot}250$, where K_G^o is the vapour phase equilibrium constant at zero pressure. The heat of reaction disagrees with the calorimetric value, but the entropy agrees with the 3rd-law value. Pentane results disagree with previous measurements, and are given by $R \log K_G^o = (1\,861/T) - 1{\cdot}299$. The heat of reaction and the entropy agree with calorimetric and 3rd-law values. W. R. A.

541.127.1 3096

The reaction velocity of ion exchange. II. NACHOD, F. C., AND WOOD, W. *J. Amer. Chem. Soc.*, 67, *pp.* 629–631, *April*, 1945.—Measurements showing the effect of both cations and anions on the rates of cation-exchange reactions were made. If the cation be kept constant and the anion varied in a series of H^+ exchange experiments, the rate of approach of equilibrium exchange is the same, but the values obtained with salts of weak acids are > those with salts of strong acids. The cation-exchange capacity increases as a function of the charge of the cation. Within a group the ion in the lower part of the group exchanges faster and has a higher equilibrium exchange, the differences being less pronounced at the end of the group. The equilibrium exchange for a series of ions in one group is a function of their size. [Abstr. 1061 (1945)]. W. R. A.

541.128 3097

Surface area of catalysts. RIES, H. E., JR., VAN NORDSTRAND, R. A., AND TETER, J. W. *Industr. Engng Chem.*, 37, *pp.* 311–317, *April*, 1945.—N_2 adsorption isotherms are used to follow area changes of a supported catalyst after heating at temps. of 340–650°C. Area values are obtained for the diatomaceous earth support after 340° and 650°C. heat treatments and for the unsupported catalyst after a 340° treatment. Areas calculated according to the Brunauer–Emmett–Teller equation show that the supported catalyst has a considerably greater area than either the unsupported material or the support. Agreement is found between the measured area of the support and the area of a model based on electron microscope pictures. An adsorption-desorption isotherm determination on the supported catalyst shows a pronounced hysteresis effect which is discussed in relation to pore structure. Consideration is also given to V_a/V_m isotherms as a means of studying specificity in N_2 adsorption on the various solids.

541.128 3098

Catalytic isomerization of 1-hexene. HAY, R. G., MONTGOMERY, C. W., AND COULL, J. *Industr. Engng Chem.*, 37, *pp.* 335–339, *April*, 1945.

541.128 : 662.7 3099

Catalysis in synthetic liquid-fuel processes. STORCH, H. H. *Industr. Engng Chem.*, 37, *pp.* 340–351, *April*, 1945.

541.128 : 665.5 3100

Catalysis in the petroleum industry. *Industr. Engng Chem.*, 37, *pp.* 310–351, *April*, 1945.—The following seven papers are part of a symposium presented before the Division of Petroleum Chemistry at a meeting of the American Chemical Society: Surface area of catalysts, Ries, H. E., Jr., Van Nordstrand, R. A., and Teter, J. W. [Abstr. 3097 (1945)]; Carbon formation in catalytic cracking, Voorhies, A., Jr. [Abstr. 3101 (1945)]; Production of isoparaffins, Komarewsky, V. I., and Warson, L. [Abstr. 3102 (1945)]; Silica-alumina gels, Elkin, P. B., Shull, C. G., and Roess, L. C. [Abstr. 3108 (1945)]; Fluidized fixed bed, Thomas, C. L., and Hoekstra, J. [Abstr. 3103 (1945)]; Catalytic isomerization of 1-hexene, Hay, R. G., Montgomery, C. W., and Coull, J. [Abstr. 3098 (1945)]; Catalysis in synthetic liquid-fuel processes, Storch, H. H. [Abstr. 3099 (1945)].

541.128 : 665.53 3101

Carbon formation in catalytic cracking. VOORHIES, A., JR. *Industr. Engng Chem.*, 37, *pp.* 318–322, *April* 1945.—Data show that the amount of carbon deposited on the catalyst at given conditions is, within limits, independent of the hydrocarbon feed rate. Correlations are derived that define mathematically the interdependence between feed-stock conversion, feed rate, and length of period between catalyst regenerations. A hypothesis is advanced as a possible explanation of the mechanism of carbon formation.

541.128 : 665.53 3102

Production of isoparaffins. KOMAREWSKY, V. I. AND WARSON, L. *Industr. Engng Chem.*, 37, *pp.* 323–326, *April*, 1945.

541.128 : 665.53 3103

Fluidized fixed bed. THOMAS, C. L., AND HOEKSTRA, J. *Industr. Engng Chem.*, 37, *pp.* 332–334, *April* 1945.—The passage of gases or vapours upward (counter to gravity) at controlled rates through a mass of powdered solid produces the fluidized fixed bed. The passage of the gas or vapour causes the powdered solid to become mobile so that it moves about resembling an agitated liquid. The fluidized fixed bed is particularly adapted to catalytic reactions in which a reaction occurs that is accompanied by a large heat of reaction. Some examples are given which illustrate the application of the fluidized fixed bed to the catalytic cracking of gas oil and a hydrogen transfer treatment of an unsaturated gasoline.

541.132.3 3104

Acid salts of organic acids as *p*H-standards. SPEAKMAN, J. C., AND SMITH, N. *Nature, Lond.*, 155, *p.* 699, *June* 9, 1945.

541.132.3 : 535.343 *see Abstr.* 2921

541.133 3105

The conductance of non-aqueous solutions of magnesium and calcium perchlorates. VAN RYSSELBERGHE, P., AND FRISTOM, R. M. *J. Amer. Chem. Soc.*, 67, *pp.* 680–682, *April*, 1945.—The conductivities of solutions of $Mg(ClO_4)_2$ in Me_2CO, MeOH and $MeNO_2$, and of $Ca(ClO_4)_2$ in Me_2CO were measured from high to very low concs., and the results discussed. The limiting slopes in the Kohlrausch formula are compared with the theoretical Onsager slopes, and the limiting transport numbers considered. W. R.

1.135.6 : 669.72 : 620.193.41 3106
The acid corrosion of magnesium. COATES, G. E. *Inst. Met.*, 71, *pp.* 457–480, *Sept.*, 1945.—[Abstr. 17 B (1945)].

.147.7 : 771.534 3107
A simple intensity scale sensitometer which conforms h American standard requirements. SWEET, M. H. *Opt. Soc. Amer.*, 35, *pp.* 379–381, *June*, 1945.—scribes a simple portable instrument suitable for ermining film speeds of ordinary negative materials. intensity variation is obtained by means of a otographic wedge, the light being that from a W lamp. J. W. T. W.

.18 : 535.551 : 532.517.3 *see Abstr.* 2785

.182.5 : 539.26 3108
Silica-alumina gels. ELKIN, P. B., SHULL, C. G., ROESS, L. C. *Industr. Engng Chem.*, 37, *pp.* 327–, *April*, 1945.—3 series of SiO_2–Al_2O_3 gels of ious concs., made by (*a*) precipitation in sequence, mixing wet gels, and (*c*) impregnation of partially-ed SiO_2 gel, were examined by Ni adsorption, small le X-ray scattering, and X-ray diffraction. Specific faces were smaller for (*a*) and larger for (*b*) than se expected for mixtures of the dried SiO_2 and O_3 gels. Maxima in curves for specific surface Al_2O_3 content for (*b*) and (*c*) at about 5% by ght correlated with minima in average particle size. Al_2O_3 was detected by X-ray diffraction for gels taining as much as 26% by wt. Al_2O_3.

.183 3109
Some Chinese clays as adsorbing agents. SUEN, ., AND YAO, F. H. *J. Inst. Petrol.*, 31, *pp.* 179–187, e, 1945.—White clays from Szechuan can be used reduce the gum content of gasoline obtained by cking vegetable oils. A study is reported of clays ecies collyrite (A) and cimolite (B)] from Nan-an and [species halloysite (C)] from Tsunyi. is most active, with marked gum-reducing perties; (B) is also effective but its decolorizing er is poor; (A) shows little utility. Resistance of samples to bleaching and temp. effect are reported. has a lower SiO_2–Al_2O_3 ratio than (B) but shows ar greater activity. Industrial application is ussed. N. M. B.

.183.2 3110
Activated adsorption of hydrogen in the neighbourhood of the Curie point. VAN ITTERBEEK, A., MARIËNS, AND VERPOORTEN, I. *Nature, Lond.*, 155, *p.* 668, e 2, 1945.

.183.2 3111
Multimolecular absorption. CASSIE, A. B. D. *Trans. day Soc.*, 41, *pp.* 450–458, *Aug.–Sept.*, 1945.—eneral statistical method is given for dealing with problem of a single species of molecule which may me either of two forms in a single phase. The ecules may interchange between the two forms to a free energy of interchange or mixing, and the tribution of the molecules between the two forms letermined by the condition that the total free gy of the phase should be a minimum. The hod is applied to multimolecular absorption which s place (*a*) in the presence of localized sites, or on to a mobile monolayer. An equation is deduced for the absorption isotherm with localized sites. It is shown that a mobile monolayer must be gaseous to give an absorption isotherm or to give surface absorption which varies with the concentration of the solute in the solution. The isotherm for multimolecular absorption with a gaseous monolayer is everywhere convex to the pressure axis. The empirical isotherms agree excellently with the equation derived theoretically. Heat is absorbed when water molecules pass from water in bulk to the monolayer, the value per mole being 2 200 cal. The area covered by the gaseous film is also estimated.

541.183.5 : 677.31 3112
Absorption of water by wool. CASSIE, A. B. D. *Trans. Faraday Soc.*, 41, *pp.* 458–464, *Aug.–Sept.*, 1945.—The water vapour pressure isotherm of wool is greatly influenced by the hydrostatic pressure on the sorbed water due to the mechanical properties of the fibres. An isotherm reduced to one hydrostatic pressure is given, and it does not show the sigmoid inflexion of the experimentally observed curve. An investigation of the absorption-desorption hysteresis of wool suggests that this is largely due to the mechanical hysteresis of the fibres. The isotherm reduced to one hydrostatic pressure is analysed using the theory of multimolecular absorption. Agreement of the theory and experimental observations is excellent. It is suggested that the CO-groups are primarily the water attracting groups in wool.

541.623 3113
Polarization effects in aromatic ethers. BREWSTER, R. Q., AND SLOCOMBE, R. *J. Amer. Chem. Soc.*, 67, *pp.* 562–564, *April*, 1945.—The extent of resonance effects in one ring of an aromatic ether produced by a substituent in the other was studied. Experiments indicate that the tautomeric or inductive effects are transmitted across the ether O atom from one ring to the other and that a substituent in one ring modifies the reactivity of a substituent in the other almost as much as if the two substituent groups were attached to the same benzene nucleus. W. R. A.

541.651 : 535.343 *see Abstr.* 2922

541.654 : 541.68 : 666.1 : 535.327 *see Abstr.* 2884

541.68 : 532.133 *see Abstr.* 2777

541.68 : 666.1 : 541.654 : 535.327 *see Abstr.* 2884

542.61 : 519.21 : 532.73 *see Abstr.* 2808

542.76 3114
The storing of hydrocyanic acid. KRIEBLE, V. K., AND SMELLIE, R., JR. *J. Amer. Chem. Soc.*, 67, *p.* 690, *April*, 1945.—HCN may be kept indefinitely when mixed with an equal volume of glacial acetic acid. The HCN is distilled out of the mixture through an ordinary fractionating column when required. W. R. A.

542.936.4 3115
Catalytic dehydration of 1-hexanol and 1-octanol. KOMAREWSKY, V. I., UHLICK, S. C., AND MURRAY, M. J. *J. Amer. Chem. Soc.*, 67, *pp.* 557–558, *April*, 1945.—Experiments on the vapour phase dehydration of 1-hexanol and 1-octanol over Al_2O_3 catalyst show that the Δ^1-olefine is the main product. W. R. A.

543.86 : 535.379 *see Abstr.* 2946

544.65 : 535.371–31 *see Abstr.* 2935

545.37 3116

The polarographic reduction of the platinum metals. WILLIS, J. B. *J. Amer. Chem. Soc.*, 67, *pp.* 547–550, *April*, 1945.—Ru, Os, Ir, Pd and Pt were studied. Only Pd gives satisfactory polarographic steps, and Pd complexes are generally reducible at the dropping electrode giving one step corresponding to direct reduction of Pd^{++} to Pd. Various supporting electrolytes which form complexes with the metal are suitable for its determination. In complexes of Pd with amines the half-wave potential becomes more negative with increasing basic strength of the amine, i.e. the complexes become resistant to reduction which becomes less reversible. The relative stabilities of the complex cyanides of Group VIII are discussed in the light of their polarographic behaviour. W. R. A.

545.7 : 535.336.2 *see Abstr.* 2892

545.8 : 535.343.3–15 *see Abstr.* 2928

545.8 : 537.363 : 612.11 3117

The effect of ionic strength and protein concentration in the electrophoretic analysis of human plasma. PERLMANN, G. E., AND KAUFMAN, D. *J. Amer. Chem. Soc.*, 67, *pp.* 638–641, *April*, 1945.—A Na diethyl-barbiturate buffer of *p*H 8·6 was used. An increase in ionic strength from 0·1 to 0·3 in a 2 wt.% protein solution decreased the apparent concentration of albumin from 57–54 wt.% and the γ-globulin rose from 10–13 wt.%. Changes of the same order were found with varying protein concentration, the ionic strength of the buffer being kept constant. Results show that the protein–salt conc. ratio influences the apparent distribution of proteins in an electrophoretic diagram. True values for the relative conc. are approached on decreasing the ratio. W. R. A.

545.81 : 535.243 *see Abstr.* 2866, 2867

545.824 : 548.73 *see Abstr.* 3129

547 : 535.342–31 *see Abstr.* 2914

547.022 3118

The new organic chemistry. HEY, D. H. *Nature, Lond.*, 156, *pp.* 36–39, *July* 14, 1945.—A lecture dealing with the reactions of free radicals. W. R. A.

547.21 : 535.32 : 536.42 *see Abstr.* 2977

548 : 539.211 : 535.417 *see Abstr.* 2948

548.0 : 535 3119

Derivatives of ipral, neonal, nostal and sandoptal: an optical crystallographic study. HULTQUIST, M. E., POE, C. F., AND WITT, N. F. *J. Amer. Chem. Soc.*, 67, *pp.* 688–690, *April*, 1945.

548.0 : 535–1 : 530.145.6 3120

Optical behaviour of non-ideal crystal lattices in the infra-red. I–III. LIFSHITZ, I. M. *J. Phys., USSR*, 7, 5, *pp.* 215–228; 7, 6, *pp.* 249–261, 1943, *and* 8, 2, *pp.* 89–105, 1944.—The behaviour is examined in a region where the wavelength of the incident waves is much greater than the lattice constant of the crystals. The problem is to calculate the electric moment of the crystal, excited by an incident wave, and the calculation is based on a set of equations given in a matrix form. The meaning of the perturbation matrix for various cases of small deviations from the periodicity is discussed, namely: (i) arbitrary concentration of small distortions (case of isotopes) (ii) small concentration of centres with an arbitrar "intensity" (case of impurities). The structure an properties of the matrix of the unperturbed proble are investigated, and the results are applied to th solution of the unperturbed equation. A qualitativ discussion of the solution of the perturbed problem made. It is shown how the absorption within th range of eigenfrequencies follows from the theor Other effects appearing in non-ideal lattices are als discussed. The absorption due to isotopes is in vestigated. A general formula for the polarizabilit is derived in the case of small perturbations, an applied to various cases, e.g. the absorption in regio of high and low frequencies and in the neighbourhoo of optically active and inactive boundary frequencie The limits of applicability of the theory are discusse A detailed examination is made of crystals containir small amounts of foreign atoms. A new frequen interval instead of isolated frequencies appears in th absorption spectrum. Much of the paper is devot to a discussion of the mathematical technique nece sary to solve the problem. A perturbation metho with a matrix formalism, is used but it is pointed o that this may only be used under limited conditions. L. S.

548.0 : 535.348 31

Coloured haloes surrounding inclusions of monazi in quartz. LAEMMLEIN, G. G. *Nature, Lond.*, 1 *pp.* 724–725, *June* 16, 1945.

548.0 : 537.226.33 : 536.424.1 = 4 *see Abstr.* 2983

548.0 : 539.32 31

Shear modes in non-piezo-electric crystal plat BHAGAVANTAM, S., AND BHIMASENACHAR, J. *Natu Lond.*, 156, *p.* 23, *July* 7, 1945.

548.231 : 535.3 : 537.531 *see Abstr.* 3028

548.574 : 553.621 : 537.228.1 31

New etching pattern of quartz and its uses for t determination of electric axes and the detection crystalline defects. CHOONG, S. P. *J. Opt. S Amer.*, 35, *pp.* 552–558, *Aug.*, 1945.—For ma purposes it is desirable to have a precise knowledge the homogeneity of quartz crystals as well as t directions of the optic and electric axes. In a n method quartz plates are etched by hydrofluoric ac under the action of an electric field. The resulti etching pattern varies with the strength of the fie the presence of twinning and other defects. Un strong fields groups of parallel lines, bands a etched zones are formed; the lines and bands indic the directions of the electric axes, and the localities the patterns are believed to be the seats of n crystalline defects arising from "primary" crys flaws. The different patterns are illustrated a discussed together with a method for determining electric axes under various field strengths. E. H.

548.7 : 535.372 *see Abstr.* 2941

548.7 : 536.424.1 = 4 *see Abstr.* 2984

548.7 : 536.71 : 539.2 : 530.145 *see Abstr.* 2743

548.73 3

X-ray topographs. WOOSTER, N., AND WOOST W. A. *Nature, Lond.*, 155, *pp.* 786–787, *June* 1945.

48.73 3125

Laue photographs of sub-crystalline regions in hybrid" crystals of potassium dihydrogen phosphate. BBELOHDE, A. R., AND WOODWARD, I. *Nature, ond.*, 156, *pp.* 20–21, *July* 7, 1945.

48.73 3126

X-ray studies on lead sesquioxide, Pb_2O_3. BY-RÖM, A. *Ark. Kemi Min. Geol.*, 18*A*, 6, *No.* 23, *pp.*, 1945.—The structure of Pb_2O_3 has been vestigated. The cell is monoclinic with the dimen-ons $a = 7{\cdot}050$ Å, $b = 5{\cdot}616$ Å, $c = 3{\cdot}865$ Å and $= 80{\cdot}1°$. The oxygen configurations are: Pb_1: oxygens at a mean distance of 2·08 Å at the corners f a distorted square. These Pb ions are probably travalent. Pb_2: 4 oxygens at a mean distance of ·39 Å at the corners of a distorted square and 2 outer nes at 2·81 Å. These Pb ions may be bivalent. me results from the search for structure analogues the systems Sn–O, Pb–Sn–O, Pb–Ti–O and Pb-r–O are given.

48.73 3127

X-ray studies on molybdenum and tungsten oxides. LÄGG, G., AND MAGNÉLI, A. *Ark. Kemi Min. Geol.*, 9*A*, *No.* 1, 14 *pp.*, 1945.—X-ray investigation of the ystems Mo–O, and W–O have been carried out. fter α–MoO_3, there are β- and β'-phases, the former table up to 650°, the latter to 700°. The β'-phase is robably Mo_9O_{26}, and is monoclinic. The γ-phase p to 700°) is Mo_4O_{11}. The δ-phase (MoO_2) is ionoclinic. A ε-phase of unknown composition is roduced when the β'- and γ-phases are heated to 50°. In the case of the W–O system, the green colour roduced when the α-phase, WO_3, is heated is caused y thermal dissociation. β-, γ- and δ-phases have een identified. A. J. M.

48.73 3128

Oriented fibres of sodium pectate. PALMER, K. J., ND LOTZKAR, H. *J. Amer. Chem. Soc.*, 67, *pp.* 883–84, *May*, 1945.—Sodium pectate fibres were pre-ared by titrating a 1 wt.% solution of pectic acid a *p*H of 5·0 with NaOH, the resulting solution eing forced through a 1 mm. nozzle into a coagulating ath consisting of 85 wt.% EtOH in *N* HCl. After reatment with 60% alcoholic 0·1 *N* NaOH and ashing with 60 wt.% EtOH the fibre was slowly ongated 38% while drying. X-ray diffraction easurements on the fibre show that the symmetry f the galacturonide chain in pectin approximates that f a 3-fold screw axis but with the angle between the lane of the pyranose rings and the fibre axis some-hat larger than occurs in cellulose and its derivatives. The sodium pectate fibre diagram can be indexed on hexagonal lattice, which again suggests the 3-fold crew axis. W. R. A.

548.73 : 545.824 3129

X-ray analysis of $Ca_2Sb_2O_7$ and compounds of imilar composition. BYSTRÖM, A. *Ark. Kemi Min. eol.*, 18*A*, 6, *No.* 21, 8 *pp.*, 1945.—Several anti-onates, tantalates, and niobates were examined. Weberite structure was established for $Ca_2Sb_2O_7$, $r_2Sb_2O_7$ and $Cd_2Sb_2O_7$, and pyrochlore structure for $Pb_2Sb_2O_7$, $Ca_2Ta_2O_7$, $Cd_2Nb_2O_7$ and $Cd_2Ta_2O_7$. The ifference between the pyrochlore and the weberite tructures is discussed. Pyrochlore has a three-imensional framework of linked octahedrons of the composition $(B_2X_6)_\infty$, weberite a two-dimensional framework of octahedrons of the formula $(B_2X_7)_\infty$. Some preliminary notes from an investigation of Pb oxides are given.

548.73 = 3 3130

X-ray investigations with potassium phosphate at low temperatures. DE QUERVAIN, M. *Helv. Phys. Acta*, 17, 7, *pp.* 509–552, 1944.—The crystal structure of KH_2PO_4 and KD_2PO_4 has been investigated at various temperatures. The transition temperature for the conversion of the tetragonal elementary cell of KH_2PO_4 to the orthorhombic form is 123° A. The corresponding temperature for KD_2PO_4 is 213° A. For KH_2PO_4 below the Curie point, the angular deformation is parallel to the spontaneous polarization. If KH_2PO_4 is cooled below the Curie point in an electric field it polarizes to equal extents in the two *c*-directions, in regions of which the linear dimensions lie between 10^{-2} and 10^{-4} cm. The oppositely polarized regions form an alternating structure, at any rate on the surface. The degree of orientation depends on the field strength. Barkhausen jumps are observed in the process of orientation. There is no lower Curie point for KD_2PO_4. At the Curie point there are strong anomalies in all X-ray reflections. A. J. M.

548.73 = 397 3131

Berylliumorthite (muromontite) from Skuleboda felspar cleavage. QUENSEL, P. *Ark. Kemi Min. Geol.*, 18*A*, 6, *No.* 22, 17 *pp.*, 1945.—A mineral not previously observed, developed in long prismatic needles, resembling allanite, was discovered at Skuleboda. Crystallographic measurements gave angles in good agreement with those of allanite. Chemical analysis showed the mineral to be a decomposed allanite with 3·83% BeO. An X-ray powder photograph showed the lines of bastnäsite. In order to try to recrystallize an eventual metamict component a sample was heated at about 1 000°C. At 10% loss in wt. the bastnäsite was replaced by a fluorite structure corresponding to the removal of CO_2 from (Ce, La..)FCO_3. At the max. loss in weight (19%) there appeared beside the fluorite phase an apatite structure (Table 2).

549.1 3132

Indexes of data for identification purposes. WELLS, A. F. *Nature, Lond.*, 156, *pp.* 535–536, *Nov.* 3, 1945.

549.211 3133

Allotropic modifications of diamond. RAMAN, C. V. *Nature, Lond.*, 156, *pp.* 22–23, *July* 7, 1945.—A reply to a letter by K. Lonsdale [Abstr. 2310 (1945)].

549.211 : 535.33–1 3134

Infra-red spectrum of diamond. RAMANATHAN, K. G. *Nature, Lond.*, 156, *p.* 23, *July* 7, 1945.

550.31 : 536.7 *see Abstr.* 3002

550.341 3135

A new type of seismic cross-section wherein accuracy of representation is rendered insensitive to velocity error. GABY, P. P. *Geophysics*, 10, *pp.* 171–185, *April*, 1945.—A method is presented which (1) simplifies computations in areas where velocity is known to vary, or may later be found to vary, laterally; (2) considerably reduces the amount of recomputation necessitated by subsequent revisions in velocity.

The conventional time-section and time-map satisfy these requirements but are generally subject to serious errors, as illustrated. Advantages believed to be peculiar to the proposed system are tabulated, and a practical method of plotting the cross-sections is presented.

550.371 : 525.233 *see Abstr.* 2724

551.31 : 624.2.023 = 3 3136

Reconstruction of the Castieler viaduct on the Chur–Arosa line of the Rhaetic railway. The theory of earth creepage pressure. CONRAD, H., AND HAEFELI, R. *Schweiz. Bauztg*, 124, *pp.* 255–260, *Nov.* 11, *and pp.* 267–271, *Nov.* 18, 1944.—[Abstr. 2726 B (1945)].

551.463 : 535.345 *see Abstr.* 2934

551.465 : 532.59 *see Abstr.* 2794

551.521.6 : 551.593.9 3137

A strong infra-red radiation from molecular nitrogen in the night sky. STEBBINS, J., WHITFORD, A. E., AND SWINGS, P. *Astrophys. J.*, 101, *pp.* 39–46, *Jan.*, 1945.—Radiation from the night sky at 10 440 ± 25 Å, discovered photoelectrically in the course of a spectrophotometric study of stars and nebulae, is found to be very much stronger than the line at 5 577 Å. The wavelength was determined from the relative transmissions through a series of filters, since spectrography would be impossibly slow. The radiation is identified with the (0,0) band of the first positive group of N_2. The absence of other N_2 bands suggests a mechanism involving conversion of the dissociation energy of N_2 into excitation via a 3-body collision. This mechanism implies the presence of photo-dissociated N atoms in the upper atmosphere, supplied possibly by a pre-dissociation effect. It is effective only if the Herzberg–Sponer value of 7·38 eV is correct for the dissociation energy of N_2.

A. HU.

551.593.52 : 535.338.4 *see Abstr.* 2905

551.593.9 : 551.521.6 *see Abstr.* 3137

551.594.12 : 525.75 *see Abstr.* 2725

553.621 : 537.228.1 : 548.574 *see Abstr.* 3123

553.94 : 535.343–15 *see Abstr.* 2924

576 : 536.7 : 532 *see Abstr.* 2771

576.3 : 615.84 : 539.166.9 *see Abstr.* 3070

576.893.12 : 535.21–31 *see Abstr.* 2857

577.1 : 537.363 : 532.13 *see Abstr.* 2773

577.15 : 541.124.7 *see Abstr.* 3093

578 : 531.717.1 *see Abstr.* 2761

578.088.5 : 537.531.9 = 3 *see Abstr.* 3036

591.86 : 537.533.72 3138

The structure of certain muscle fibrils as revealed by the use of electron stains. HALL, C. E., JAKUS, M. A., AND SCHMITT, F. O. *J. Appl. Phys.*, 16, *pp.* 459–465, *Aug.*, 1945.—[See Abstr. 2059 (1945)]. Fibrils from molluscan muscles were examined with the electron microscope and found to possess periodic variations in structure. To make these variations visible, it was necessary to treat the fibrils with reagents of high electron scattering power (electron stains). Phosphotungstic acid was found to be suitable. This stain combines with specific regions in the fibrils, forming a regular geometrical pattern with a regular cross striation, representing a fibre-axis spacing of about 145 Å. X-ray diffraction data obtained by Bear from intact muscles are compared with the electron microscope observations.

61 : 537.533.72 *see Abstr.* 3040

61 : 778.3 : 537.531 *see Abstr.* 3033

612.11 : 535.215 : 535.65 *see Abstr.* 2958

612.11 : 537.363 : 545.8 *see Abstr.* 3117

612.2 : 539.16.08 *see Abstr.* 3069

612.664 : 537.363 *see Abstr.* 3019

612.75 : 539.264 = 4 *see Abstr.* 3081

612.84 : 535.7 *see Abstr.* 2959

612.84 : 535.733 *see Abstr.* 2961

612.85 : 534.771 *see Abstr.* 2851

615.84 : 576.3 : 539.166.9 *see Abstr.* 3070

621.798.15 : 539.217 313

The kinetics of package life. II. The temperatur factor. OSWIN, C. R. *J. Soc. Chem. Ind.*, 64, *pp.* 224–225, *Aug.*, 1945—The resistance to aqueous penetration of regenerated cellulose wrappings varies approximately as the $1/(\text{sat. v.p.})^2$ of water at the temperature of measurement. This gives a "half-life" formula for hygroscopic packages.

628.9 : 535.7 *see Abstr.* 2960

631.81 : 533.275 *see Abstr.* 2819

662.7 : 541.128 *see Abstr.* 3100

662.75 314

Stability of fuel oil. BROOM, W. E. J. *J. Inst. Petrol.*, 31, *pp.* 347–352, *Sept.*, 1945.—[Abstr. 2738 (1945)].

665.5 : 539.155.2 *see Abstr.* 3068

665.5 : 541.128 *see Abstr.* 3100

665.53 : 541.128 *see Abstr.* 3101–3103

666.1 : 541.654 : 541.68 : 535.327 *see Abstr.* 2884

666.1.031.2 : 536.2 *see Abstr.* 2970

666.112.7 : 537.533.8 *see Abstr.* 3044

666.221.3 : 535.327 *see Abstr.* 2885

666.3 : 539.4 *see Abstr.* 3088

667.624 : 536.55 *see Abstr.* 2987

669.018 : 532.782 *see Abstr.* 2814

669.14 314

The velocity of propagation of brittle cracks in ste GREENFIELD, M., AND HUDSON, G. *Proc. Nat. Aca Sci., Wash.*, 31, *pp.* 150–152, *May*, 1945.—A pr liminary announcement of some measurements of t velocity of propagation at room temperature. T value obtained is 40×10^3 in./sec. with a me deviation of 6%. L. S.

669.72 : 620.193.41 : 541.135.6 *see Abstr.* 3106

669.74 : 535.42 : 537.531 *see Abstr.* 3032

676.1.02 31

Physical evaluation of straw and other agricultu residue pulps. Proposed method. YOUNGER, J. AND ARONOVSKY, S. I. *Paper Tr. J.*, 120, *TAP Sect.*, *pp.* 187–189, *May* 10, 1945.—After digesti

ith (CaO + NaOH) for 5 hr. at 140°, the straw is isintegrated under standard conditions in a beater tted with a drum washer, and the yield of digested ulp is calculated from the sum of the weights of the ashed pulp and of the solids removed from the ashings by centrifuging. The washed pulp is then rocessed in a Valley beater (TAPPI Method T200 -43), and formed into hand-sheets (T205 m-42) hich are evaluated physically by the usual standard APPI methods. Results are tabulated and scussed. J. G.

76.4 3143

Use of various papers in paper laminates. BARBER, . W. *Paper Tr. J.*, 120, *TAPPI Sect., pp.* 190–193, *May* 10, 1945.—The effects of the properties of the aper base on those of laminates produced from it are lustrated by tabulated data. The tensile strengths f the laminates decrease in the order: sulphite, lphate kraft, alpha stock and rag. They are nfluenced largely by the physical structure of the aper, and especially by the ratio of the numbers of bres lying in the 2 directions of the sheet. The onding strength of the laminate increases with the ickness and absorbency of the paper used. H_2O- esistance and compressive strength are lowered by he use of the more refined pulps, and the latter only y use of the harder pulps. Fabric base laminates are etter than paper base products only in impact and onding strengths. The use of paper laminates for efrigerator breaker strips, aircraft flooring and for rming blocks used in the manufacture of Al aircraft arts are discussed in detail. J. G.

77 : 536.423 *see Abstr.* 2979

77.3 : 539.216.1 *see Abstr.* 3075

77.31 : 541.183.5 *see Abstr.* 3112

78 : 539.32 *see Abstr.* 3085

79.5 : 539.4.016.3 3144

Relative temperature stability of stressed plastics. AUER, J. A., SCHWERTZ, F. A., AND WORF, D. L. *Mod. Plast.*, 22, *pp.* 153–156 *et seq.*, *March*, 1945.—Apparatus and test procedure for heat distortion tests re described, in which account is taken of specimen xpansion. Results of rate distortion and cumulative istortion temperature measurements are given for a umber of thermoplastic and thermosetting materials. Comparative temp. deflection curves are given for various types of plastic materials. E. R. A.

679.56 : 539.4 3145

Physical strength properties of moulded fibre-resin preformed materials. MOSHER, R. H., AND GRIFFIN, J. B. *Mod. Plast.*, 22, *pp.* 147–152, *Feb.*, 1945.—Several commercial resins and fibres were studied to determine the physical properties which could be obtained using various types of moulded resin-fibre preforms. Experimental results show effects of fibre type, of resin type and of using beater-dispersed resin instead of adding by impregnation. Physical strength properties of melamine-phenolic resin preforms are shown. E. R. A.

7.01 : 530.1 *see Abstr.* 2733

727 : 621.317.2 : 378 : 53 *see Abstr.* 2730

771.35 : 535.318 *see Abstr.* 2882

771.534 : 541.147.7 *see Abstr.* 3107

778.3 : 61 : 537.531 *see Abstr.* 3033

778.33 : 621.386.842 3146

Some properties and uses of X-ray intensifying screens. TASKER, H. S. *Photogr. J.B*, 85, *pp.* 75–91, *July–Aug.*, 1945.—[Abstr. 2626 B (1945)].

778.4 : 621.386.84 3147

The development of stereoscopic photography and radiography. DUDLEY, L. P. *Brit. J. Radiol.*, 18, *pp.* 185–192, *June*, 1945.

778.6 = 3 3148

The Agfacolour-method for colour photography and kinematography. LUMMERZHEIM, H. *Elektrotech. Z.* [*ETZ*], 63, *pp.* 583–586, *Dec.* 17, 1942.—3 superimposed layers of colour-sensitive materials, the lowest being sensitive to red and orange, the middle to yellow and green and the top layer to blue and violet are exposed to the subject and the photograph is taken according to the subtractive method. By the addition of a second substance to the oxidation products of the developer the latter are transformed into a dyestuff which is bluish-grey, purple and yellow in the 3 layers respectively. The chief difficulties in producing these 3-layer films was their excessive thinness and the necessity for preventing diffusion of the dyestuffs in the dry as well as in the gelatinous state. The principle lends itself both to the reversal method and the negative-positive method. The manipulations are only slightly more complicated than with black and white photography. R. N.